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Making Tank Plates.—I.

BY JOSEPH HOMER.

Tanks are generally made in England with rounding corners at bottom and sides. The plates are bolted together by flanges, external or internal.

In Fig. 1 *A* represents the 4′ 0″ square

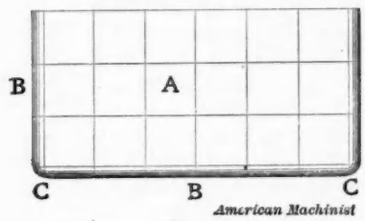

Fig. 1

flat plates, *B* the 4′ 0″ curved side and bottom plates and *C* the triangular corner plates, these comprising all the patterns.

For the square pattern plate a wood pattern is made first, with double shrinkage. The metal pattern is seen in Fig. 4, and a portion of the detail of the wood pattern is seen enlarged in Fig. 3.

Fig. 2 is a portion of the casting, in which *A* is the plate and *B* the flange, *C* the facings for the bolts, *D* the bolt holes, *E* the brackets which strengthen the flanges, *F* the planing strip. The plated portion *A* is an open frame, as shown in Fig. 4, in order to diminish its weight for lifting about. The interior of the frame in the iron pattern is formed during molding with loose plates *K*, seen also in the same figure. The plated frame of the wooden pattern is made of 7-16-inch or ½-inch stuff, framed with half lap joints at the corners, glued and screwed. Corner pieces are glued in to give extra metal next the rapping and lifting holes *a*, *b*, Fig 4, in the iron pattern. The flanges *B* are screwed around the edges. A 5-16-inch projection is nailed round, forming the chipping or planing strip *F*, giving calking allowance. The facings *C* are nailed on at the print centers, and prints for the bolt holes *D* upon the facings. The brackets *E* are nailed midway between the prints for the purpose of strengthening the flanges against the pull of the bolts. Enlarged details of these parts are shown in Fig. 3, in which *A* is a portion of the frame forming the plated portion, *B* is the flange, *C* the facings, *D* the prints for the bolt holes, *E* the brackets, *F* the planing strip. The usual proportion of taper is shown in Fig. 3, averaging about ⅛ inch in flange and brackets and from 3-32 of an inch to ⅛ of an inch on each side of the prints, which are necessarily of the pocket, or drop, form.

In many cases small hollows, or fillets, are inserted around the flanges and brackets. They may average from ⅛ to 3-16 of an inch. Often the facings *C* are omitted, but it is better to insert them, because they afford clean faces for the bolt heads and nuts and grommet washers used in fastening the tank together.

To get a true metal pattern from this wood pattern the latter must be rammed,

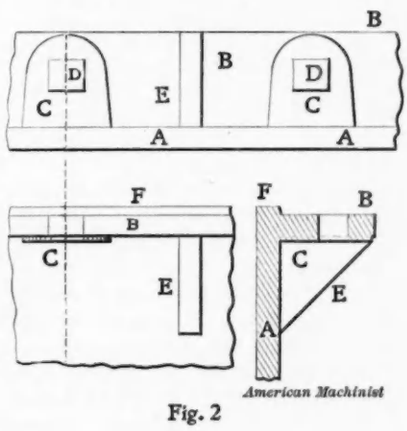

Fig. 2

flange upward, on a true bottom board, and then turned over. The ramming must be even and regular on each side of the flanges, in order to prevent them from becoming crooked and wavy, or out of square, which might easily happen to so flimsy a pattern carelessly rammed.

There is a probability of the iron pattern cast from this coming out with the flanges slightly convex, or rounding longitudinally. It will not exceed from 1-64 to 1-32 of an inch, and is due to the slightly diminished shrinkage in the central parts. Down the sides there is the shrinkage pull of the flanges and plate, pulling the opposite sides together. At the central parts the pull is less, because there is a body of sand forming the open part of the frame, and this resists the shrinkage of the middle parts of the flanges. Hence they usually cool very slightly convex. This can be remedied by lifting the cope and loosening the sand in the center before the plate has quite cooled down. It must not be done too early, or the plate will cool on the top too quickly and curve upward around the sides, becoming hollow in the back. Or the flanges may be put on the wood pattern with a slight concavity to compensate for the convexity which they will assume in cooling. Or, if neither of these things are done, a light planing cut should be taken off the outer vertical faces of the flanges in the iron pattern.

After the iron pattern has been checked over to test its accuracy, the whole of its surface is roughly filed, especially all the vertical faces of flanges, brackets, facings and prints. These need not be made bright, but only made fairly smooth, so that no tiny projections or roughness shall be left to tear the sand down in molding.

Rapping and lifting holes are then put in at the four corners, see Fig. 4, *a*, *b*; ½-inch or ⅝-inch holes being suitable. The plate is then put in the core oven and raised to a temperature a little higher

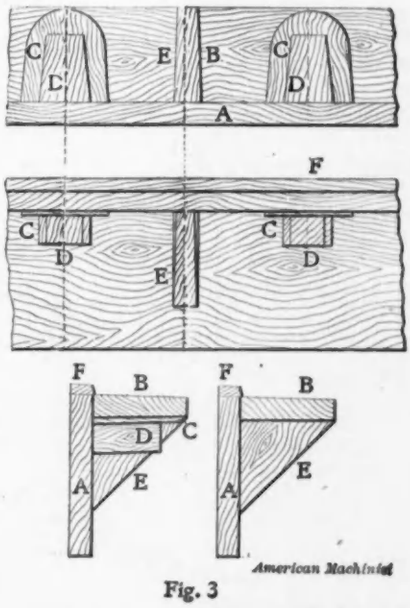

Fig. 3

than the hand can comfortably bear. A lump of beeswax is then rubbed all over it lightly. The plate will then be

fit to mold from. A coat of shellac varnish may be applied over the beeswax with advantage. The loose plates *K*, in

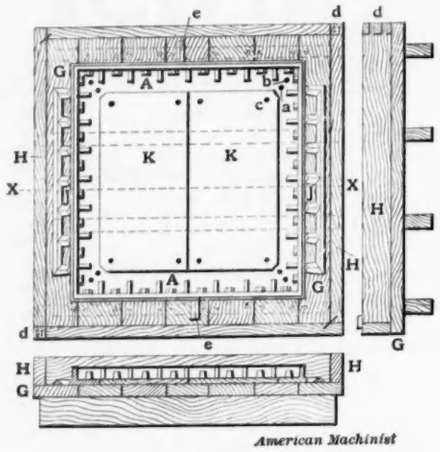

Fig. 4

Fig. 4, are also provided with lifting holes *c*.

The molding of the plate is done most economically by the use of two bottom boards for ramming opposite sides of the plate upon, in preference to the usual method of ramming the flanged side first, turning over and then ramming the cope upon the back of the pattern, over the drag. The ramming is also facilitated by the use of wooden frames before the molding boxes are brought into requisition, the frames saving the trouble of tucking the sand underneath the bars, or stays, by hand.

The flasks comprise a cope and drag (iron), each measuring 5′ 2″ square outside and 6″ deep by 1″ thick, and filled with the usual vertical bars in the cope

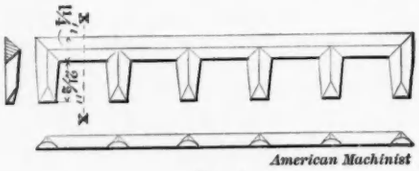

Fig. 5

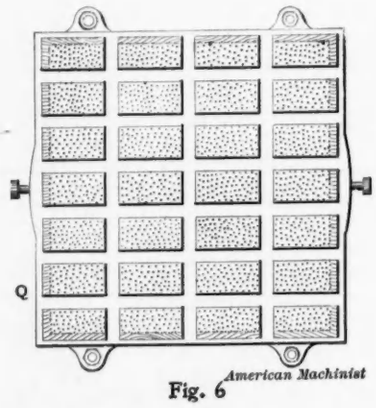

Fig. 6

and flat bars in the drag. They are provided with swivels for turning over and with lugs and pins for cottering together for casting. The bottom boards measure 5′ 2″ square, are made of 2″ stuff, battened together, with four battens 2½″ thick by 5½″ deep, and the boards are well varnished on their top faces.

In ordinary ramming of the flasks over patterns on bottom boards, all the sand which comes directly underneath the bars or stays has to be tucked underneath the bars with the fingers and rammed with the pegging rammer, operated diagonally. To avoid unequal ramming, and to save time, the frames shown in Figs. 4 and 10 are used with advantage. Fig. 4 represents the first stage of the ramming of the flanged, or drag, side of the plate, Fig. 10 of the plain, or cope, side.

In Fig. 4 the plate *A* is shown flanged side upward upon its bottom board *G*. *H* is the wooden frame 5½″ deep, or nearly as deep as the flask; made in two pieces, dovetailed fast at two corners *d*, but clamped only with iron dogs at the others, in order that the frame shall be

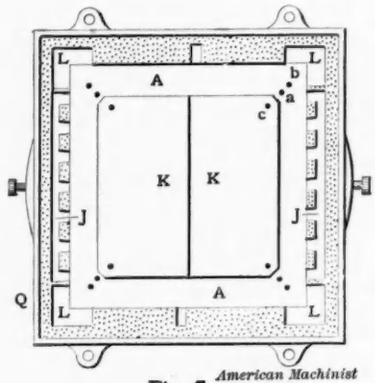

Fig. 7

readily drawn away sideways after the ramming of the sand within it is done. The frame measures 4′ 9″ inside and is stout, being 2½″ thick. The pattern runners *J* are laid down upon the bottom board within the frame, on two opposite sides of the plate.

The runners are thin, see Fig. 5, which shows also the sprays, twelve in number; six on each side of the frame. Runners *e* for the flow-off gates, or risers, are also laid or fastened upon the board in the positions indicated in Fig. 4. The two loose plates *K*, Fig. 4, are laid down in the center of the frame, and all is ready for ramming.

Facing sand is strewn over the pattern and pressed in among the brackets, prints, etc., to the thickness of ¾″ or 1″, and then heap sand is shoveled over it, rammed and struck off level with the top of the frame. The frame is then removed and the drag flask *Q* put on, Fig. 6, and its bars pressed upon the sand until its joint face touches the joint face of the bottom board, and cottered; the little remaining sand is then rammed between the bars, level with their top faces, and round the edges, filling up the narrow spaces where the bottom board is seen exposed in the figure. The flask and board, still cottered together, are then turned over and the board removed, leaving the back of the pattern and the joint face exposed, Fig. 7. This is duly swabbed, and the pattern drawn.

To steady the pattern in drawing the

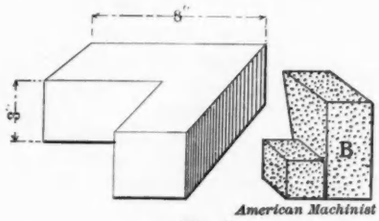

Fig. 8

device shown in Fig. 7 is adopted. Four angular blocks, *L*, of cast iron, each as deep as the total depth of the pattern, are laid upon the mold exactly coincident with the corners of the plate.

One of these blocks is shown in perspective and dimensioned in Fig. 8. Their own weight keeps them in position, and they coerce the movement of the plate during withdrawal, preventing it from becoming pulled to one side or the other. Four men lift the plate, one at each corner, using lifting screws with eyes for the purpose, rapping of course being done previously with an iron rapping bar inserted in the holes at the four corners. Before the pattern is withdrawn the two middle plates *K* are lifted out. With care there should be no breaking down of the mold.

The cores for the bolt holes are made in a box like Fig. 9, the core recesses being arranged diagonally, in order to facilitate the delivery of the cores without fracture. A core is shown in Fig. 8.

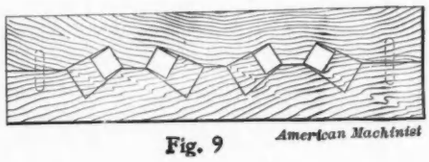

Fig. 9

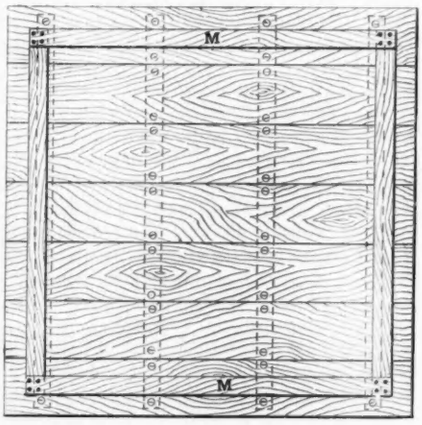

Fig. 10

It will be observed that the cores stop themselves off in the mold, so saving the

molder's time, a matter of perhaps an hour on a plate. As each core is put in, the sand behind it is pressed against the back of the core to tighten it. The molder uses his thumb or finger for the purpose, and this leaves a little impression on the top of the sand. The swab is then run round over these impressions and over the tops of the cores; the little finger impressions, and the slight

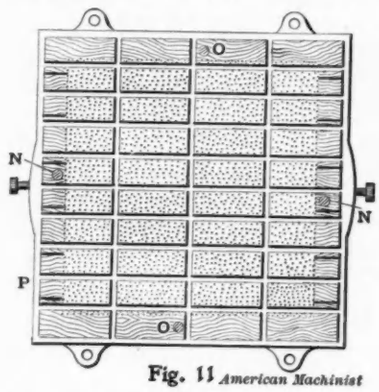

Fig. 11 *American Machinist*

joint openings between cores and print impression, filled up with sand, and the whole sleeked over with the trowel. The blacking bag is dusted over the surface of the plate, but no attempt is made to black the flanges or brackets. The bottom portion of the mold is now complete.

The ramming of the cope is done upon a bottom board similar to that used for the drag. The same board would do, but with two boards two molders can work on the job at once, one ramming the drag and the other the cope.

A frame is used for ramming the cope, Fig. 10, *M*, as in the case of the drag. It is a little thicker than the distance of

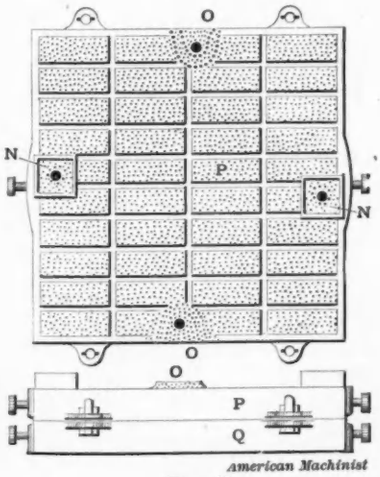

Fig. 12

the edges of the vertical bars in the cope from the face of the board and back of the pattern. If the edges of the bars are ¾″ away from the board, then the frame will be 1″ thick, so that the bars will be pressed ¼″ into the sand, rammed level with the top face of the frame. The frame is made entire, and not in two, like the frame *H* in Fig. 4. The reason is that *H* is deep and *M* is shallow. So *M* is lifted vertically, the inner edges being tapered also.

The cope *P* is placed over the rammed board in Fig. 11. Upon this board the ingate pins *N* are rammed. Also at opposite sides, the pins *O* for risers or flow-off gates. The runner pins are 1¼″ diameter, the flow-off pins 1″ diameter.

It will thus be noted that the back of the pattern is not rammed upon at all, the bottom board doing duty for that. This saves time in cottering boxes together and allows two molders to work more economically, because not in one another's way, but each on his separate flask.

The mold is shown complete in Fig. 12. *P* is the cope, *Q* the dray, now cottered together; *N N* are the ingates, *O O* the flow-off gates.

When all the tackle, too, is prepared in this way it is almost impossible to go wrong, and youths, or second-rate molders, can turn out these plates cheaply; 2s. 6d. (62 cents) each is the price paid, and two youths and two laborers can turn out five plates a day with two patterns and five sets of flasks. I will defer the description of the making of the curved plates to another paper.

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The Trial of the Battleship.

Now what sort of a structure is this? [battleship]. A huge steel honeycomb —frames and ribs and plates and braces in every direction. Look at the inextricable tangle of them in the shattered "Maine." No more great expanse of deck with the tiers of guns in diminishing perspective, such as one sees in the old wooden frigates and three-deckers. But compartments everywhere—272 of them in the "Indiana." Little steel boxes and big steel boxes—boxes inclosing guns and boxes inclosing engines, and a box for the helm and labyrinthine passages in and out of and around them where daylight never gets; and endless doors, doors, doors—354 water-tight doors and hatches of the "Indiana" every one of which somebody must look after and see closed when the ship goes into action. Else why compartments if you cannot keep them separate, so that if water comes in from a ram-thrust or torpedo or shot, you can confine it to one or two cells and so prevent the ship from filling. There are more compartments in some of the smaller cruisers—the "Cincinnati" has 487; but cruisers run and battle-ships do not.

In this assemblage of cells is placed—jammed is a better word—one of the most complicated aggregations of mechanism that have ever been brought together. There are from a hundred to a hundred and fifty steam cylinders in the multifarious engines; not so many as in the cruisers, perhaps. The "Columbia" has 184; but the "Columbia" keeps out of the way of 13-inch shot. The battleship "Iowa" has 152. The "New Ironsides," the most powerful fighting vessel in our navy at the close of the last war, had just three.

What steam does not do electricity does. There are wires everywhere. The dynamos are running constantly, for the closed steel boxes get no daylight and must be lighted, while with equal constancy the blowers draw out the foul and force in the fresh air. But on all sides there is machinery. Machines work the guns; machines turn the turrets; machines manage the helm; machines propel and pump the ship and feed the boilers and drive the fires; machines hoist ammunition, boats and anchors; machines find the position of the enemy; machines transmit orders from the captain to every part of the structure; machines make the light; machines condense the drinking water and cool it; machines, themselves propelled by other machines on board, go out under water to blow up the adversary.

That is the thing—11,000 tons, mainly of steel cells, crammed with mechanism of extreme complexity, and which stays afloat only as long as a certain number of the larger amidship cells remain water-tight; that is the thing which is called a battleship; and that is the thing which is the subject of the coming experiment, upon the result of which may depend national victory or defeat.

The more complex any mechanical structure the greater the liability to derangement. Like any chain, its strength or efficiency is that of its weakest link; just as in the animal organization the higher the development the more varied and numerous its diseases. It follows inevitably, therefore, that whether in a battleship, or a bridge, or a building, or any other engineering linkage of many co-operating parts, high specialization carries with it increased liability to injury, until the latter overbalances. The battleship experiment will determine whether or not the limit in the war vessel has been passed. Battleships are not designed as are buildings and bridges. The sizes of the members of a viaduct properly to resist all foreseen strains and stresses can be prefigured, and an abundant margin left to cover all accidents by multiplying the result by, say, "ten," the so-called factor of safety. But battleships have no factor of safety, nor would bridges, if anyone expected that a blow of several thousand foot tons, concentrated in the space of a square foot, would come crashing against any part of them at random. Who can predict where that shock will expend itself as it travels over the structure searching for the weak places. Drop your watch on the floor, and it loses five minutes in the next twenty-four hours. Why? The wheels seem to you to be

moving as usual. Nor can the jeweler explain the cause until he has dissected the mechanism. When 1,150 pounds of steel, traveling at the rate of 2,000 feet per second, hit some hundred complicated mechanisms packed into 272 compartments in what represents a steel shell 85 feet cube, set afloat, is there anything short of omniscience which can tell what is going to happen, and for how long the thing is going to be a useful fighting machine before it becomes a helpless target or takes its plunge to the bottom?—Park Benjamin, in the Independent.

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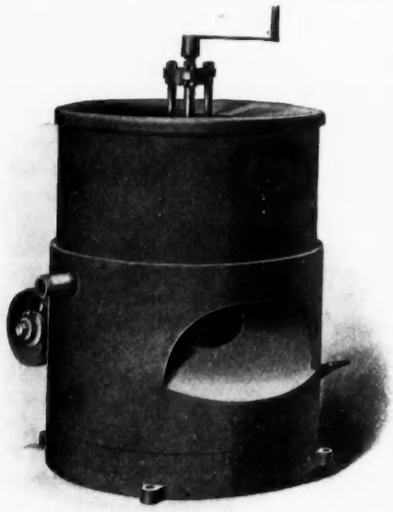
A Centrifugal Oil Saver.

We cannot recommend this machine for its beauty, but it has perhaps a stronger claim to recognition in its undoubted usefulness. Its function is one of constantly growing importance. The saving of the oil that mingles with the chips that come from bolt and nut and pipe machines, screw machines, turret lathes and other tools, is an economy that cannot properly be neglected, and in which this machine proves effective. The principle of the machine will be understood by reference to the sketch, Fig. 2, which shows its essential features. The spindle of the machine has a long single bearing in a yielding step, which is held normally central by rubber springs, but yields sufficiently to allow the spindle to find its own running center to accommodate the load, which usually is not perfectly balanced. This bearing is almost entirely covered by the driving pulley, and oil for it is poured in when necessary through a hole in the pulley hub. The hopper is keyed to the extreme top of the spindle. The bottom of the hopper, however, slides up and down, its hub being splined to fit a feather on the shaft. Three upright studs from this hub carry at the top a piece with a central screw, the lower end of which is stepped in the top of the spindle. The bottom of the hopper, therefore, is raised and lowered by turning this central screw, which is done by a removable crank on the square end. In the position shown the bottom is in its upper position, and the hopper is ready to receive its load of chips. These are poured in at the top, and when the machine is started the oil is thrown out through the inclined slit where the bottom meets the hopper shell. The oil is caught in the gutter or trough which extends all around the case, and a pipe from this leads it into any suitable receptacle. When the machine is stopped by the foot operated brake the bottom of the hopper is lowered by turning the screw; then upon starting up again the chips are thrown out below the oil channel and slide down the inclined plane and out at the side of the machine. The raised central ring prevents any of the chips getting down to the pulley and step. The belt runs out horizontally from each side of the pulley and then, under pulleys placed obliquely at the back, up to the pulley on the countershaft overhead. The hopper of the machine is its most responsible part, and as this is made of open hearth steel, and its periphery entirely without perforations, it is not easy to conceive how it could be made stronger. The periphery of the hopper is attached to the hub by three arms, with central vertical webs to each. There are also three vertical webs on the under side of the hopper bottom. The machine occupies about 28 inches square of floor space and weighs about 600 pounds. It is made by Rogers & Co., 127 West Thirty-second street, New York.



A CENTRIFUGAL OIL SAVER.

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As suggesting the time and labor sometimes necessary to the development of an important invention, it is to be noted that the original British patent for the Parsons' steam turbine was dated April, 1884, and, it being about to expire, the Judicial Committee of the Privy Council have recommended an extension for five years.

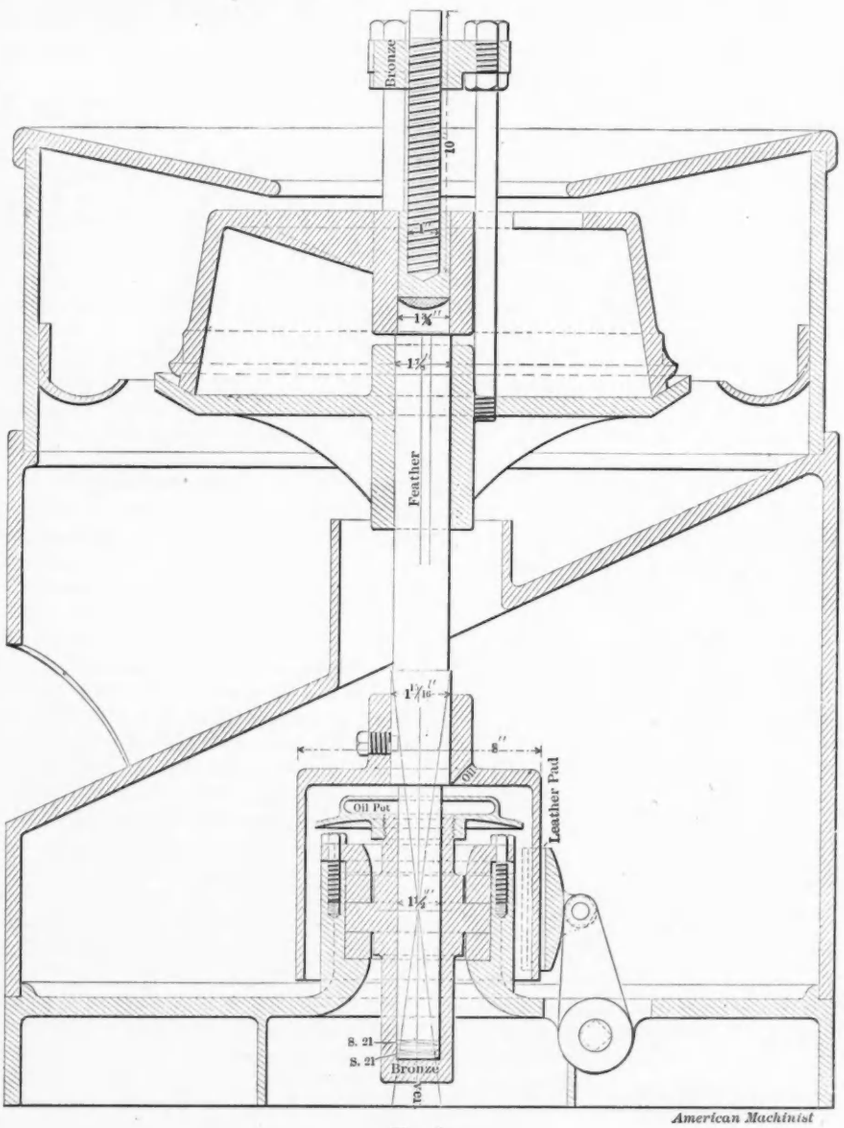

Fig. 2

DETAILS OF OIL EXTRACTOR.

Shop Tools Driven by Compressed Air.—II.

A ROTARY MOTOR AND ITS APPLICATIONS.

One of the most interesting of the class of rotary engines which are made

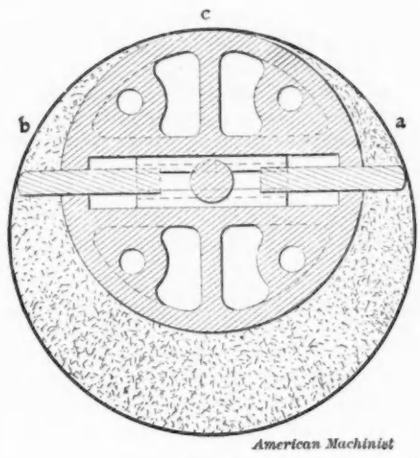

Fig. 1
PLAN OF MOTOR.

to be driven by compressed air and offered to the mechanical world for various shop uses is that of the Empire Engine & Motor Company, Orangeburgh, New York, which we here illustrate. The motor consists of a revolving piston having considerable eccentricity relatively to the shell in which it revolves, with opposite radial sliding blades, whose edges are constantly in contact with the inner surface of the shell. Fig. 1 is a section of the motor, showing the essential features of its operation. The air (or steam) enters at *a* and exhausts at *b*. The precise location of the ports it is not essential to indicate, the revolving drum or piston being in contact with the shell at *c*. In principle this is a very old type of rotary engine, but in the present machine some improvements are introduced which materially change its character. The opposite sliding blades have

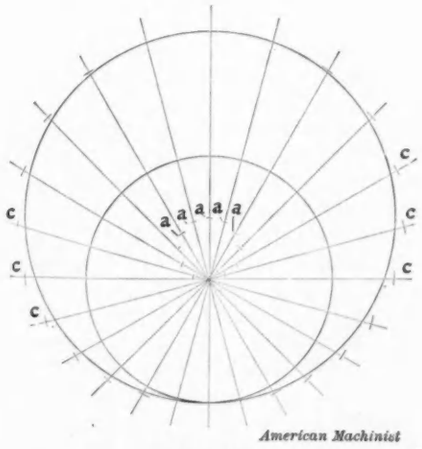

Fig. 2
DIAGRAM FOR SHAPE OF SHELL.

usually been independent of each other and have been held out to contact with the shell by springs, by the pressure of the air or steam behind them, or by some equivalent device. In the present motor the blades are positively and unyieldingly held in contact with the shell for the entire revolution, and in operation the two opposite blades are practically the same as a single solid blade; that is, the distance from the outer edge of one blade to that of the other is constant. It is evident from this that the shape of the shell cannot be a true circle, and, in fact, it is not. The exaggerated diagram, Fig. 2, gives us an idea of the requirements of the case. The points *a a a* indicate the path of the center line of the blades, and the points *c c c* show the path of the edges of the blades and the shape to which it is necessary to bore the shell. It will be seen that the figure is not a true ellipse, but is rather ovoid or egg shaped. Fig. 3 shows the means by which the blades are set out. The wedge *d* bears against the backs of the blades *c c*, and is moved in or out by the nut *c*, operated by the long screw *b*, which, when adjusted, is locked by the nut *a*. As the wedge *d* moves edgewise

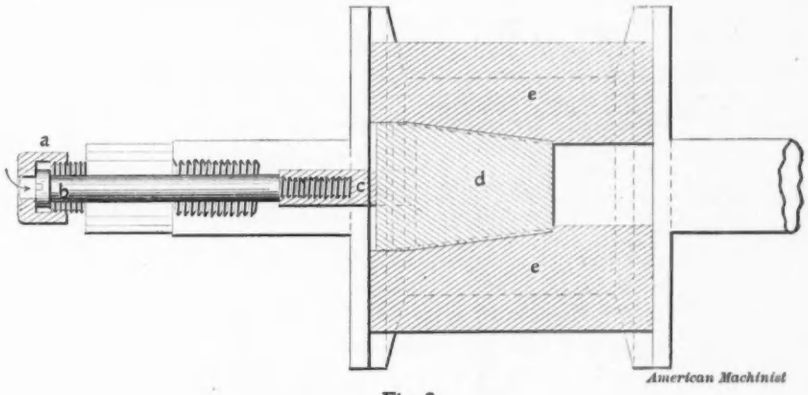

Fig. 3
ADJUSTMENT OF BLADES.

with the blades as they revolve the nut *c* is provided with a T head, fitting into the end of the wedge and securing always a central thrust. This T head is cylindrical in section at its extremity, with a contracted portion behind it (see Fig. 5), and sliding in a corresponding groove in the end of the wedge it is enabled to either advance or withdraw the wedge as required. This motor is always balanced and runs without jar or vibration, the blades being always central in the shell and the head in which they slide being symmetrical and balanced upon its own spindle. Referring to Fig. 1 it will be noticed that the wedge *d* is thicker than the blades *e e*, the inner edges of the blades being sunk into the wedge sufficiently to serve to guide and steady the blades from tipping sidewise. Provision is made for adjusting the heads to the ends of the blades.

This motor is applied by its builders to all the various shop uses to which it is applicable, two or three of them being here illustrated. Figs. 4 and 5 show in outline and section a drill or reamer to be used in places where the ratchet or hand brace is traditionally applicable.

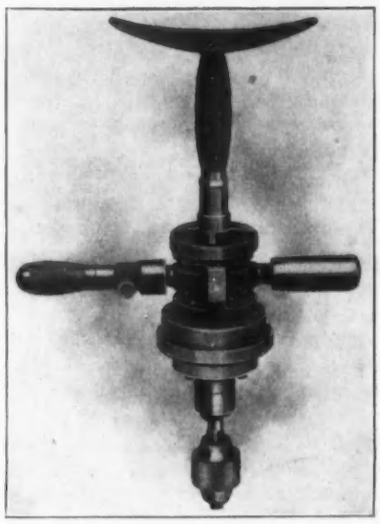

Fig. 6.
PNEUMATIC BRUSH DRILL.

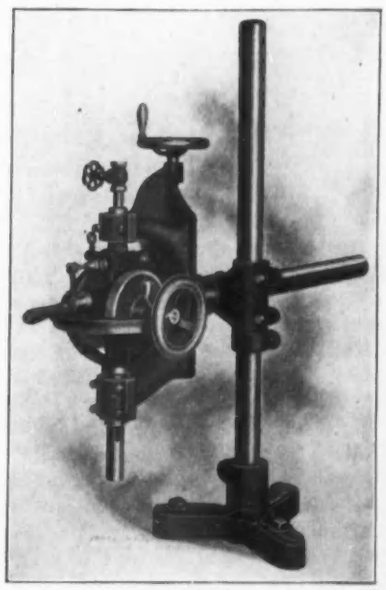

Fig. 7.
MOUNTING OF PNEUMATIC DRILL.

The motor is geared to the reamer spindle in the ratio of 10 to 1, a bevel pinion on the end of the motor shaft working into a large bevel gear on the reamer spindle. When used only for drilling or reaming it is of course necessary to run the drill only in the one direction, but when used also for tapping it is made reversible, one valve controlling both movements.

Fig. 6 shows a breast drill driven by this motor. The motor is geared 14 to 1, a small central spur pinion driving, by two opposite idler pinions, into an internal spur gear. The weight of the drill complete is 10½ pounds, it will drill holes up to half inch diameter, and it is stated that it will drill a five-sixteenth inch hole through 2 inches of cast iron in a minute.

Fig. 7 shows another style of this drill mounted on a "crab" or "old man." As will be seen, it may be set at any angle and the drill fed up and down by the hand wheel at the top of the slide. The hand wheel at the side is used to turn the drill around by hand.

Fig. 8 shows the motor applied to a differential chain hoist. This may of course be used in any position or for any service where any of the other chain hoists are used. Two motors are used, each geared to the hoisting chain on both sides, and with the blades of the two motors set 90 degrees apart. The hoist is rapid and the load will not run down. Hoisting and lowering are both fully controlled by the single rod.

The motor is also furnished independently of the drill or hoist, for driving portable tools or light machinery of any kind. The air pressure called for is the usual pressure at which air is generally employed for shop use, or from 60 to 80 pounds gage.

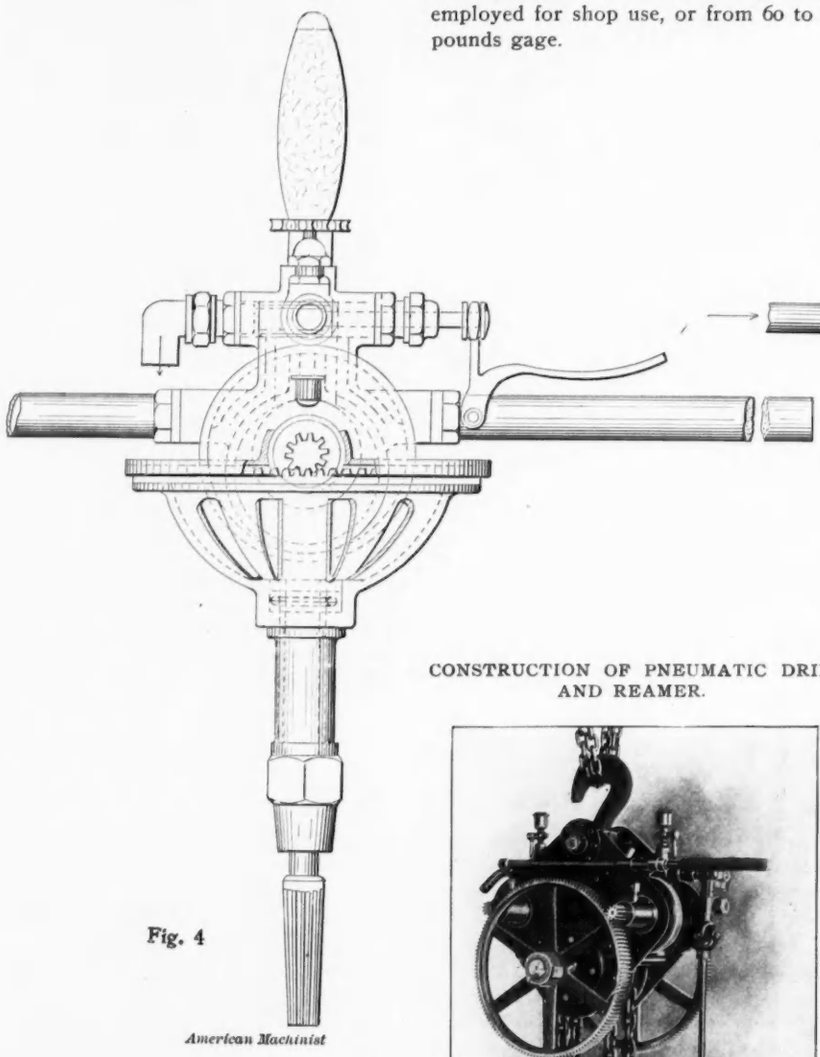

Fig. 4

American Machinist

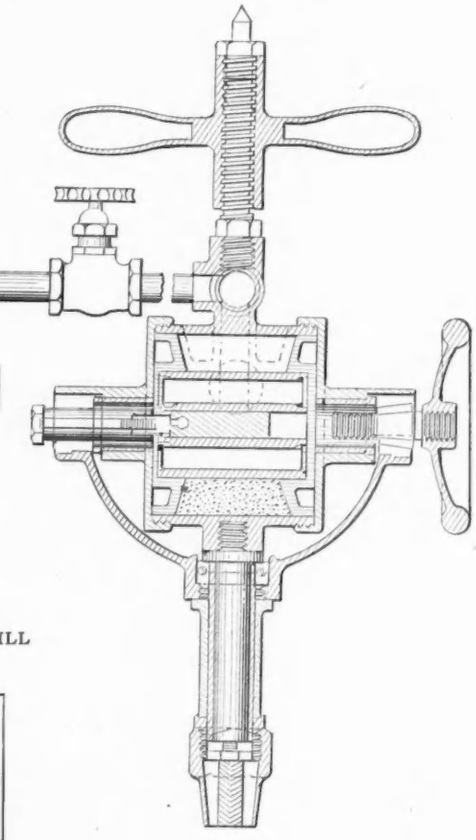

Fig. 5

CONSTRUCTION OF PNEUMATIC DRILL AND REAMER.

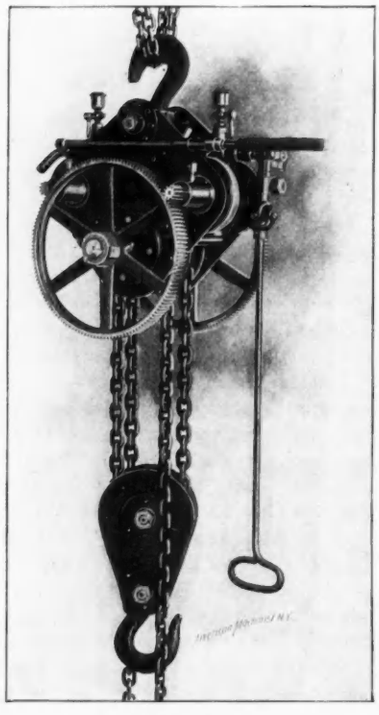

Fig. 8.

PNEUMATIC DIFFERENTIAL HOIST.

Information About Patents.

The British Patent Office publishes, in book form, abridgments of patents relating to the various classes of inventions. These are of very great value, not only to the examiners in the United States Patent Office and to inventors, but to the general public. They afford a ready means of gaining full and accurate information as to patents granted in England in all classes of inventions and enable manufacturers and artisans to readily determine what inventions have become public property through expiration of patents covering them and what are protected by patents still in force.

Nearly every Commissioner of Patents for the past forty years has recognized the necessity for the publication of like abridgments of United States patents. It has been repeatedly pointed out that such abridgments would be of the greatest value to inventors and to the public. Hundreds of thousands of inventions, many of them of great value, have by expiration of the patents granted on them become free to the public to make and use; but those who might engage in the manufacture of such inventions are often unaware of their rights in relation to

them. Such abridgments would furnish in compact and convenient form precisely the information desired. Such abridgments would also enable inventors to quickly determine their position in the arts, and prevent them from wasting time and money in inventing what is already old. They would no doubt prevent by the information contained in them the filing of many useless applications, and would enable applications to be filed generally in better shape than at present. A full set of these abridgments would be practically indispensable to attorneys practicing before the Patent Office, and those relating to particular arts would undoubtedly be largely called for by inventors and manufacturers throughout the country. The Commissioner of Patents has called the attention of Congress to this matter, and has earnestly requested the appropriation of such sum as may be needed for the preparation of these abridgments. A. F. T.

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Fully Prepay Foreign Postage.

An American engineer reads a paper at a meeting of the American Society of Mechanical Engineers. "American Machinist" prints an abstract of this paper. An English engineer, proprietor of a large establishment, sees this abstract, writes to us requesting us to get a copy of the paper, if possible, for which he will pay. We write to author, asking him to mail his paper direct to English engineer. One month elapses. We get a dilapidated envelope that has been to England, refused on account of deficient postage and penalty. With it an indignant note from the author of the paper. Mad. We write him as follows:

* * * Dear Sir—I have your favor of — inclosing envelope returned from Mr. * * * and this is certainly an unfortunate occurrence, but let us consider what probably happened. Mr. * * * is a manufacturer of considerable importance. He has purchased a great deal of American machinery, and it is probable that he gets a great deal of mail matter at his place bearing on the outside the addresses of various American manufacturers of machinery. Probably a great deal of this reaches him underpaid and contains, mainly if not entirely, advertising matter. This has probably led to his leaving an order with someone in the office and who receives the mail to decline underpaid matter of that character, and thus your letter, which he undoubtedly would have received had he personally seen it, was declined.

I am sure that Mr. * * * has not intended any discourtesy to you in this, and I know he really wanted the copy of the paper referred to. I expect him over here in a short time and will tell him how he can obtain a copy at the office of the A. S. M. E., and in the meantime will write and explain to him why he has not received it from you.

Copy of this letter was sent to the English engineer, who thereupon writes:

While thanking you for addressing this gentleman in the first instance, we would express our indebtedness to you for replying so adequately to him. The reason given by you in your letter is an exact explanation of his letter being refused, and it does appear to us that the printing of the former in your paper (names excepted) would be beneficial to the commercial interests of this and your side of the water. Yours truly,

* * *

Suitable explanations have been made and peace declared. The incident is instructive. It shows how such a small thing as a postage stamp can work much mischief by not being put on.

▲ ▲ ▲

Two Jigs.

BY A. H. CLEAVES.

I find in some places the question becomes What is possible? while in others it becomes What is profitable?

In a shop with a limited supply of tools, or where one certain tool, such as a milling machine or scraper, is crowded with work, it may become necessary to draft the single spindle drill, upright or horizontal, or the engine lathe into the service as a substitute. Such was the case in getting out the machine work on the piece illustrated in Figs. 1 and 2, a plan and elevation of the same piece of work. To start with, it was decided to machine off the surfaces *A*, *B* and *C* before drilling the holes *D*, *E*, *F* and *G* in a separate jig. It will be seen by reference to the dotted circles that an ordinary pair of straddle mills used on an arbor of 1 inch diameter, with 1½ inch collars, would need a radius of 4¼ inches or 8½ inches diameter to cover the work, owing to the hub *H* being in the way; while an end mill cutter 2½ inches in diameter, dropped onto the work from opposite sides, would cut *B* and *F* without any trouble.

Having a large upright drill, and a small one, both single spindle, the jig shown in Figs. 3 and 4 was the one I designed and used with good results; though having since secured two 3-spindle drill presses I should make another jig like the one seen in Figs. 7, 8 and 9; the drills mentioned being run one fast and one slow, while each spindle admits of three changes on the drill cones, making six speeds altogether.

Fig. 3 is a plan, and Fig. 4 an elevation and partial section of the jig in actual use. Fig. 6 is the cutter used and other features in connection with it, to be explained.

We use a drill with lever handle; also a separate quick rack and pinion movement and a worm wheel feed for heavy work. The spindle we graduated ourselves, so it is an easy matter to bring the cutter near the work with the quick feed in connection with the graduation marks and remove quickly in the same way. The slow worm feed is used in coming onto the work.

In Fig. 4 *I* is the surface of the drill press table and *J J'* two studs fastened into the slots in the same, which are located by bringing the cutter *K*, Fig. 5, down into the opening *L*, Fig. 3, in the

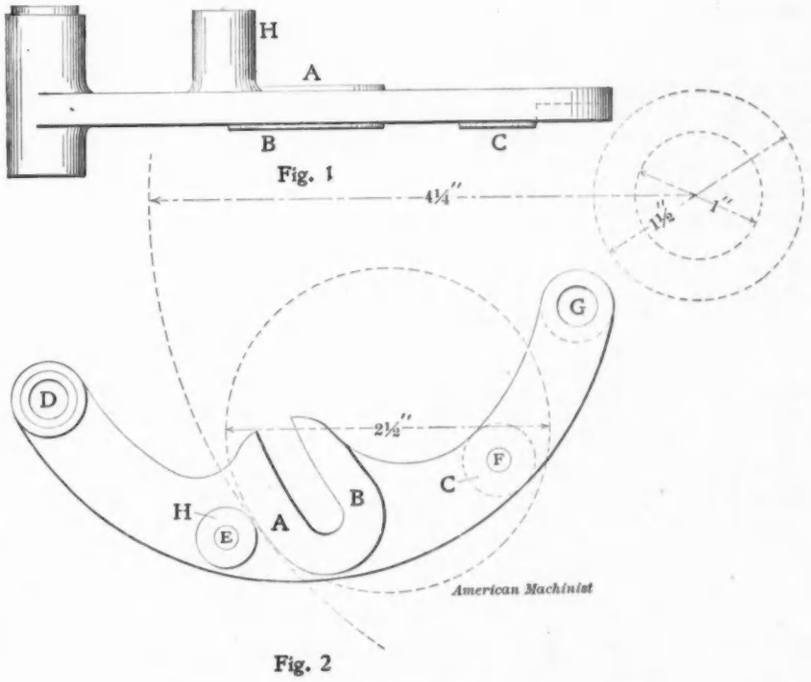

Fig. 1

Fig. 2

THE PIECE TO BE MADE.

jig. The stud J' is nearer the center of cutter M than the stud J, so the space between J' N, Fig. 3, is narrower than that at J O, to bring the cutter in line with the studs when the jig is reversed, or turned upside down.

Then in Fig. 4 the distances R and S are the same, and P is the same as Q. So when the stop collar on the drill spindle is set right for A it will come right for B and C when the jig is turned over, and the circles J' N and J O on the studs J J' will bring the hole L under the cutter or center L. The center line of the jig T is central between A, and B and C as required. The studs J J' have heads to prevent the jig lifting, although in this case we find it unnecessary, as the cutter K is free in L, not requiring accuracy sideways in merely surfacing. For the same reason L is not bushed, but bored out in the casting. U U are taper wedges for holding the work and V V are V places in the casting for locating the work.

Referring again to Fig. 6, W is a collar which may be used when the taper is inclined to loosen and let the cutter drop, as frequently happens in worn tools. X is the drill spindle, and the collar is fastened to this with screw and brass seat at Y, while three set screws like Z admit of truing and fastening the cutter K when wobbly. Our drill press is new and the tapers well fitted, and they make no trouble in this way.

The end of the cutter or mill is shown in Fig. 6, and the lips are made to draw-cut, their faces being tangent to a small circle in the center nearly the proportion shown, and moving in the direction of the arrow. The cutter is 2½ inches in diameter with ten teeth.

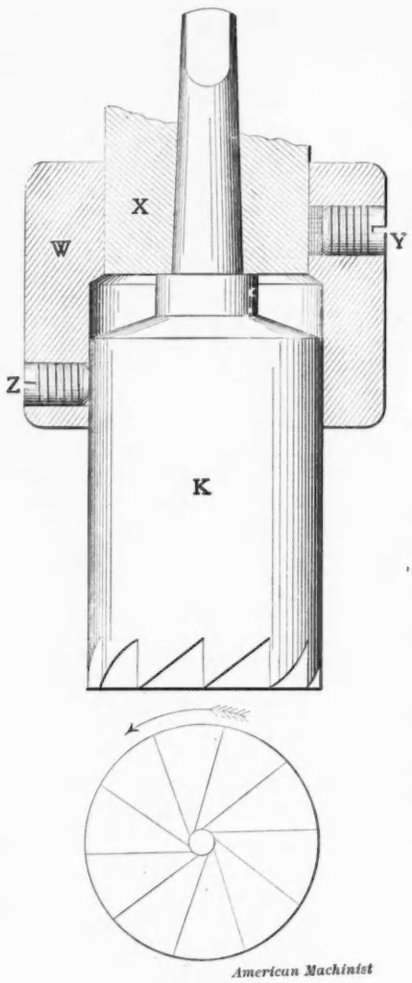

Fig. 6
THE FACING CUTTER.

centers A and B, and is used first in one and then in the other, as the work is turned over. In the drawing the cutter is made left handed, but the same, and the jig as well, should be reversed. An oversight in drawing, but immaterial for showing the principle. A and B are hollow studs, and the bushings C and D, where they project from the face of the jig, are used in these studs to swivel the work upon against the cutter E, a butt-mill cutting from the side, which I think is preferable to the end-mill.

The same requirement from the ends of rest pins like H to the center line I is observed as in the other jig, the distances F and G being alike. The studs A and B can be secured in the bed of the drill press, or in a drilling plate fastened to the same. The screw D is hollow to allow escape of chips, and it also tightens the work against the bushing C, which has a stop shoulder. The set screw K may be made better to fasten from the same side of jig as D and with the same screwdriver. Fig. 9 is a movable templet or piece for drilling J, and is movable on account of the cutter E. The holes L, M, N cover O, B, P, respectively. The holes should be drilled first and pins inserted while cutter E is milling.

Chicago, Ill.

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A correspondent wishes to know how any of our readers may have been successful in making pits under heavy tools, such as boring mills for instance, absolutely water tight. He states that he has had difficulty in accomplishing this, though he has cemented both the inside and outside of the walls. Can any of our readers give information on this point?

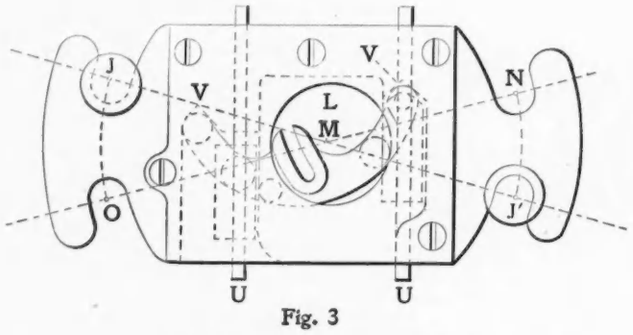

Fig. 3

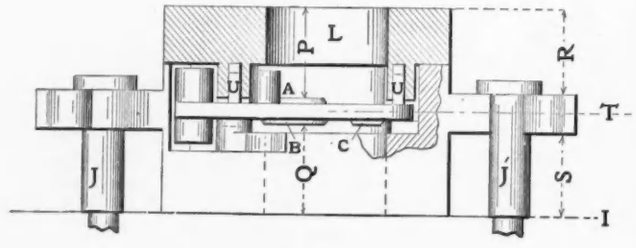

Fig. 4

FIXTURE FOR FACING.

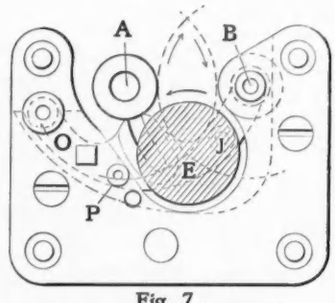

Fig. 7

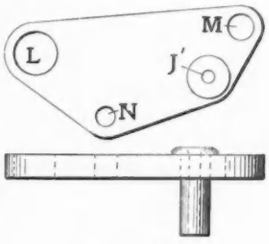

Fig. 9

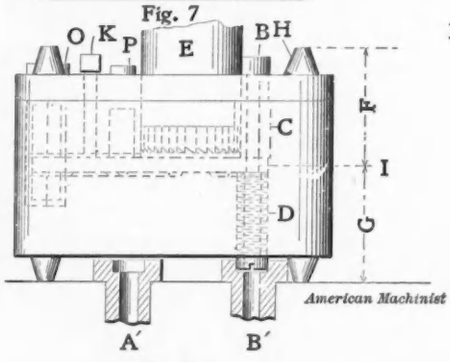

Fig. 8

JIG FOR DRILLING AND FACING.

The other jig shown in Figs. 7, 8 and 9 completes all the operations on the piece at one holding. The jig swivels on two

Foreign News Notes.

There are at the present time no less than thirty-four bills before the French Chamber of Deputies for the increase of duties on various articles that have remained as they are since the radical changes that were made in 1892. Among the items on which it is proposed to put an increased duty are electrical accumulators, on which the maximum duty would be increased from $3.28 to $4.05 and the minimum duty from $2.50 to $3.18 per 100 kilogrammes. On bicycles and parts, including pneumatic tires and parts, there is a proposed increased of the maximum duty from $48.25 to $133.80, and of the minimum from $42.46 to $96.50 per 100 kilogrammes. Soft steel tubes would be increased from a maximum of $9.65 to that of $13.50 and from a minimum of $7.72 to that of $11.58 per 100 kilogrammes. Other articles being aimed at are lead, lead ores and alloys of lead and motor cars.

M. Chefneux, the engineer, is going to Jibutil, Abyssinia, to inspect the railway in course of construction from that point to Harar. He is to be accompanied by two of his countrymen, who are about to undertake a journey through Abyssinia in the interests of several leading French firms, who have combined in order to open up new markets for French commerce. The venture is assured of official support, and is also being promoted by chambers of commerce in various French centers.

During the year of 1897 New South Wales imported $4,731,715 worth of hardware, $1,613,743 of machinery and $464,586 worth of agricultural implements, the major part of which were imported from Great Britain.

During the period of good harvests in the Argentine Republic, from 1889 to 1894, 135,000 tons of fencing wire, 100,000 plows, 680,000 plowshares, 2,262 seed sowers, 27, 680 reapers, 2,600 threshers and 7,000 winnowing machines, in addition to many tons of minor implements, found a ready market in this country, the farmers being the principal purchasers. While these materials fell off during the period of depression through which the Republic, in common with nearly all parts of the world, has passed, there is at the present time every prospect of a revival of the old time relations, and it would be well to watch this market closely.

American agricultural machinery has become very popular with the people of South Africa, and the five years just ended show a very satisfactory increase of this business there. American harvesters and reapers are coming into general use, and, while a few years ago, we only sold to that market the cheaper and heavier classes of implements, to-day we are introducing our higher priced and better grades of goods very successfully; so much so that the British manufacturer, who formerly had control of this market, is feeling the effect of our competition very keenly.

Most of the machinery in connection with electrical installations in British Guiana is imported from the United States, but machinery used in the cane factories is almost entirely imported from Holland.

The bulk of our exports to New Zealand consists of locomotives and refrigerating machines, and there is a demand for cheap gas and oil engines for stationary and marine work, which we are supplying, although it is claimed that the workmanship and material are inferior to those of English make.

To Victoria, N S. W., we ship iron working machines, carding, spinning and weaving machines, in small quantities, the larger part of that trade, at the present time, going to Great Britain. The pumps used in that country are almost wholly of American manufacture. The director of an agricultural department in Siberia is asking English manufacturers to supply him with catalogs and price lists of agricultural implements. This might also be an opportunity for American manufacturers to look after.

There is room in Ceylon for a good oil engine, of a type that could be guaranteed to give satisfaction.

It is reported that the employment of acetylene for driving engines is quite practicable, judging from a series of experiments that have recently been made at Compiegne. It is claimed that acetylene develops three times the energy of the usual illuminating gas, and that the only change needed to transform an ordinary gas engine into an acetylene engine was a reduction in the size of the in-take valves. The best mixture seemed to be 10 of air to 1 of gas. With these proportions it has been found that engines ranging from 8 to 16 horse-power cost about 6 centimes per horse-power per hour at the rate that is at present in force for calcium carbide.

The output of pig iron in Russia during the past year has been estimated at 1,857,000 tons, which was an increase of 240,000 tons over the output of 1896. Of this amount there was an increase for the two years named in the northern works from 4,800 to 7,200 tons, in the rural districts from 581,000 tons to 676,000 tons, in the central districts from 134,700 to 161,800 tons, in southern Russia from 641,500 to 723,500 tons, in Poland from 209,000 to 253,000 tons, in the southwest districts from 2,400 to 2,900 tons and in Siberian private works from 5,640 tons to 11,140 tons.

A decree has been issued by the Chilian Government whereby manufacturers of cotton textiles will be allowed to import machinery for use in their mills free of duty until the year 1902.

A. F. TENNILLE.

American Tool Business in Great Britain.

Mr. Charles Churchill, of London, called at this office a few days ago, and, in conversation regarding the machine tool business abroad, stated it as his belief that we have only just commenced to build up the trade in American machine tools in Great Britain.

He said that immediately upon the ending of the late engineering strike there his firm was flooded with inquiries and orders for new tools, and it is his belief that the conditions which now obtain there will lead to a very great increase in our business with English engineering concerns, many of which have been running along for many years with old and out of date equipment which must, in his opinion, be almost entirely replaced by modern machine tools. He thinks the course of business will be such as to virtually compel the owners of these establishments to put in new equipment, and that the English tool builders will be in no way nearly equal to the task of supplying the demand for it, aside from the fact that the English tool builders cannot supply a given tool of a good quality at any lower, if as low, rates as it can be supplied from our best shops here.

Mr. Churchill seems to agree with our view of the case that many of the English shop proprietors are, generally speaking, rather conservative and little inclined to consider new ways of doing things, but thinks they have been very much held back by the attitude of the men toward improved machinery, and that the increased freedom they now feel will result in very rapid strides along the lines indicated.

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Mr. Carl Hering states that iron can be cleaned from rust easily and completely by coupling it electrically with a rod of zinc and immersing the two in a bath of weak acid. The method is especially recommended for use in cases in which the rusted bar contains hollows difficult of access.

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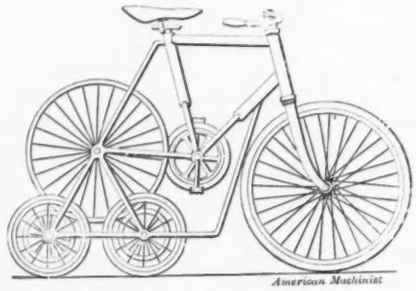
Machinists who have much filing to do, and especially those who work on die work, know the bother sometimes caused by filings which must be continually removed, either by a brush or by blowing them out. Mr. Robert G. Pilkington, a machinist, of 2730 Gamble street, St. Louis, has undertaken to obviate this difficulty by providing a rubber bulb which slips over the file handle, and which, by a slight pressure of the thumb, produces a small blast of air which removes the filings, the operation being performed without the necessity of picking up any special tool for the purpose, and, of course, with practically no loss of time.

Another Patent for a Worthless Device.

A short time ago we had an account of a so-called invention on which a patent had been granted, which patent we considered nothing more or less than an encouragement and an assistance to patent attorneys in getting money from an ignorant inventor for something which could be of no possible value whatever to him. We illustrate herewith another invention which is precisely of the same class. We are informed that its inventor, who is a groceryman, read an account of the Holman friction locomotive, and reasoned that if this principle was good for a locomotive it ought to be equally good



A SENSELESS AND WORTHLESS YET PATENTED INVENTION.

for a bicycle. We grant that the groceryman was right thus far; the principle is as good for a bicycle as it is for a locomotive. But what the groceryman failed to perceive is that it is absolutely worthless for either, and the Patent Office, in granting a patent on such a device as this, sanctioned a thing which is not and by no possibility can be useful, and its only effect is to enable a patent attorney and the United States Government to get money from an inventor for which they give him nothing of the least value in return.

No one at all familiar with the principles of mechanics would give such a device a moment's consideration or consider for a moment the claims made for it that by its use it is as easy for a rider to go at the rate of 40 or 50 miles an hour as he could go at 15 or 20 on an ordinary wheel.

▲ ▲ ▲

Strap and Blocking Combined.

The sketch herewith shows a device which any machinist will readily "catch on" to. It is a strap for securing work on the planer or shaper, on the face plate of a boring mill or lathe or elsewhere with the blocking always attached to it. The pin hole is so located in the hexagon block as to give a different distance to each face, and as the hight is also changed by turning the strap over, twelve different hights are secured. The figures show the highest and lowest positions. This device was recently patented.

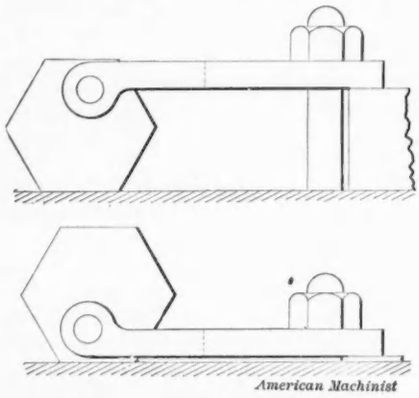
Letters from Practical Men.

Shop War Experience.

Editor American Machinist:

It is not easy to ignore all the talk of war that is going on around us, and I suppose it is not necessary to do so. It is to be hoped that the opportunity for remark in this line will soon cease, so that if availed of at all it should be done speedily. Whatever may be going on of a warlike character must necessarily be of the greatest interest to the mechanics of the land as such, because, after all, they are the most important agents in it. A fort or a battleship is equipped and backed by mechanical skill almost exclusively. The steel works and the machine shops from which the armament originates, and by which the supply of projectiles and other material is maintained, are quite as necessary, and, in the numbers of men employed, of vastly more account than the powder mills that some of us more readily think of. The up-to-date equipment also represents the best material and workmanship of the day, and perhaps nowhere is the world's progress in the mechanical arts more completely exemplified than in its guns and projectiles.

Now, I am a shop veteran of the last war. It happened that my active life in the trade had begun in 1861, when the great civil war was inaugurated, and all through the succeeding four years I was employed upon war material. That was the day of the cast iron, smooth bore, muzzle loading guns, and of cast iron spherical shot and shell. I worked for a long time at the lathe upon shot and shell patterns for a large foundry. I made pat-



COMBINED STRAP AND BLOCKING.

terns for small solid shot, for 24 and 32 pounder and 8 inch, 10 inch, 13 inch and 15 inch shot and shell, and I thought at the time that I was doing some pretty good work. In connection with the work I first became practically acquainted with hundredths of an inch as living realities. Mechanics of to-day may turn up their noses at that, but, for general machine work, that was then generally the most advanced practice. The graduated steel scales with hundredths had then not long been on the market, and the micrometer for thousandths and less was not in use.

The patterns were all made in halves, tongued together. Those for the small solid shot were molded in "cards," the halves being fastened together by a screw in the center, and each thus clamping a branch of the gate. I turned more of the larger sizes of patterns and more than any other of the 24-pounders, whose diameter, as near as I can recollect, was a little over 5¾ inches. The castings were of excellent iron, and pickled so that there was not a trace of sand or scale. The halves were first chucked and faced off on the flat and tongued and matched to a gage, although the halves were never considered interchangeable, and the halves of each complete pattern were numbered together. There was a long taper stem for the core print on one half, and this half was made the "female," so that it would set on the board for ramming up the nowel. For turning the outside or spherical surface there was a solid chuck fitted to the lathe spindle, or rather a pair of chucks, one for the male and one for the female, and the half pattern was held on for the turning by a center bolt tapped into the middle of the inside of the pattern and tightened by a socket wrench before the chuck was screwed on the spindle.

For the circular rest we had a flat plate cast with two strips on the under side big enough to plane the V's in to fit the ways of the lathe, a hub for a large central pin and a raised circular rib of large diameter for the rest to swing around on. The rest had a screw and slide to set the tool for different diameters, and also a quadrant and worm for feeding. The worm was on the right hand as you stood in front of the lathe, and it had to be worked by hand all the while. That was awfully tedious, and it wasted time when you wanted to swing the tool around from one spot to another or to begin another cut, so after a while I got a sheave on a vertical stud at the back of the lathe, and a chain around the quadrant and sheave, and then straight to the regular rest of the lathe, and feeding the lathe rest backward then fed the tool around the ball very comfortably. For light scraping cuts I never got over the way of shoving the rest around by hand instead of waiting for the feed. The cutting point of the tool had, of course, to be set just to the hight of the center, so that in turning the top half of the pattern the entire top could be finished. Several experimental castings of each size and several alterations had to be made in the patterns before there was proper allowance for rapping, shrinkage—these, of course, to some extent balancing each other—and for the vertical give of the mold when poured. The patterns were all made somewhat shorter in diameter vertically. Four one-hundredths of an

inch was allowed for the 24-pounders and more than that for the larger sizes. For this adjustment, or for getting the exact hight of the semicircle, it was only necessary to slide the rest along on the V's. It was necessary also to have the center of tool travel exactly under the center of the lathe spindle, and to have got this dead right would have been a matter of considerable trouble; but it happened that I had a swing head lathe (that's what we called it), and that made it as easy as cracking eggs. The swing head also came in handy when I had to turn the taper stems or core prints. I have had so many jobs on that lathe and one or two others with swing heads that I have always been ready to say a good word for them, and I often find myself wondering why they are not built to-day.

The core boxes I had nothing to do with. They were cast from very accurately made patterns, and were finished by hand work, the faces of the halves being placed for the final adjustment, the large ramming hole opposite the stem ing bored and faced outside and a shouldered finishing plug fitted to it.

The shells made from these patterns were among the best castings I have ever seen. The iron was of the highest grade, the molds were dry sand, the partings were scarcely discoverable, limit gages were used for the outside, with a difference of, I think, only four one-hundredths of an inch for the 24 pounders and a little more for the larger shells. There were also limit gages that would reach inside the shell and measure the thickness all around the sides, another gage for the depth, and there was also a close weight limit. Each shell was also picked with a pointed hammer to discover any possible flaws on the top of the casting or opposite the taper fuse hole. The hole was drilled and reamed very accurately to another gage. This was all the machine work that we did on the shells. I appreciated the importance of having the holes right, so that the fuse plugs would fit; but I cannot say that I appreciated the importance of all the other tests. Taken all through, the production of these shells probably represented the good work of thirty-five years ago just as closely as the production of the modern projectiles represents the good work of to-day.

TECUMSEH SWIFT.

▲ ▲ ▲

A Good Clear Line to Work to.

Editor American Machinist:

An accurate and clearly defined line to work to is important in punch and die work, and one method of getting such a line, that is accurate and at the same time very convenient to work to, was obtained as follows:

After the blanking die was finished and hardened I roughed the punch out, leaving about 1-64 of an inch all around; then filed the face of it bright and tinned it, flowing solder on while it was hot until it was about a sixteenth deep all over the face. Then placing the punch over the die as central as possible, after cooling, I hammered the solder face of the punch into the die, which made a good, clear and accurate line or impression of the die to file to. After filing down to this line as close as necessary I forced the punch into the die, cleaned off the solder and finished as usual.

WILLIAM PITT.

Independence, Mo.

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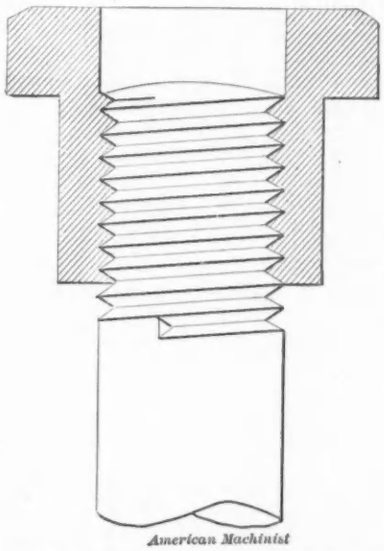
The Sulzer Milling Cutter and Nut. —Gear Tooth Profiles.

Editor American Machinist:

Several things in Mr. Miller's recent articles seem worth comment and among them the quick pitch spiral milling cutter shown in process of being ground in one of the illustrations of the Sulzer shops. This pattern of milling cutter is in wide use in Europe and has decided advantages over our own.



A NUT THAT IS STRETCHED LIKE THE BOLT.

On the nut question the Sulzers are only half right, and yet half right is better than all wrong. If the nut could be held wholly by a top flange, as in the figure, the threaded portion of the nut being a tube with a cross section outside the threads just equal to the section of the bolt at the root of the thread, the arrangement would be theoretically correct —both pieces would be in tension and would stretch alike. The square Sulzer thread is not as good from this standpoint as the usual shape. In fact if the thread angle were steep enough the arrangement would be self-compensating. The strain on such a bolt and nut would make the bolt smaller and the nut larger, and the bolt threads would slide down the nut threads and so bring the upper threads in contact and equalize the strain on all the threads.

In all that has been written about the teeth of gears the second feature of the involute tooth has not been mentioned. That is that it is a good old tooth as well as a good new one. The epicycloidal tooth is correct only when new. The clearance curve at the root of the involute tooth has the effect of making the mating tooth overrun like a piston over the counterbore of its cylinder. With the epicycloidal tooth the tendency is to wear shoulders at the roots and to dub off the corners.

JOHN E. SWEET.

▲ ▲ ▲

Another Rig for Drilling Bushings.

Editor American Machinist:

That rig for drilling plug holes in bushings in your issue of April 21 is a very neat affair, just the kind that I can imagine a fellow would take considerable pleasure in getting up. It of course works very nicely, and does just what it was made for. It is, however, also just the thing that provokes some other fellow to think of variations upon it. For the purpose that it was made for it does seem to be a rather expensive thing to make, and the range of spacing which is possible with the fixed grooves provided is necessarily limited. For the latter reason especially I am inclined to believe that the use of a master bushing is better, and I am also quite sure that it must be cheaper, notwithstanding the assertion of W. A. G. to the contrary.

The sketch herewith shows how I think, just at this moment, that I would be likely to make a rig for this job. I would have a double ended arbor with a drilled bushing, or a master bushing, on one end and the bushing to be drilled on the other end. I have drawn hexagon nuts because I have not perfect confidence in the knurled nut. I know the hexagon nuts would hold without screwing up very hard, while I should have some doubts about the other, even if I kept screwing it up every time hard enough to soon chafe my hand. This arbor with the bushings on I would support on the little—but long—standard with the two open V bearings. The guide for the pin at the right, which is over the master bushing, would be fastened to the side of the base with a couple of screws, and the guide for the drill the same way. The weight of the pin would be enough to hold its point in place in the master bushing when drilling. An open or forked lug on each side of the base would be handy for clamping it to the drill table, although, with the guide for the drill provided, it would not be very necessary to have the standard fixed, and if it was bolted down the drill guide would not be of much use. My rig brings the work down pretty close to the table, which is another good thing.

I would ask no better fun than to have

a race with W. A. G., my rig against his, and a hundred bushings for each to drill. If the time of making the rig was included in each case so much the better for me. If such a race could be arranged, and if I should win, as I would be apt to, it might not be considered decisive after all, because I would ring in at least one other condition to help me, and Mr. W. A. G. or anybody else would then not have to acknowledge which particular was to blame for my success. This trick of changing two or more conditions at once is all right from the standpoint of the fellow that wants to win—steam engine people and lots of others do it—but it is not the best practice in the world for those who want to know which condition is the winner and why. I certainly would not use a Farmer drill, and I am quite surprised that anyone in these days should suggest it for this specific job. I had lots of experience with Farmer drills years ago. The boss bought out the whole stock of a dealer. They were very cheap at the beginning, but they were dear enough before they were all used up. I dropped them as soon as I had a chance to. The American mechanical public also has shown its good sense by dropping them, as I do not find them in any up-to-date catalogue of machinists' tools and supplies. The Farmer drill in its legitimate occupation of drilling straight holes, when you don't crowd it hard enough to twist it, is not so bad, and the straight lip makes it pretty good for brass work in general, subject to the same condition of not crowding it, but when it comes to grinding it for drilling the taper holes, as suggested, it makes a very ugly drill on account of the thickness of the sides. I know I could make a common every-day flat drill that for this job would be vastly better, or, if the importance of the drill guide was insisted upon, then I would take a drill rod of the right size for the guide, and somewhat larger than the large end of the hole which is to be drilled in the bushing, and make a drill like what I have tried to sketch. The pattern for the V bearing casting could be whittled out on a band saw and an hour's planing would finish it in the shop. The guides for the drill and for the index pin would involve a little work, and when they were done the rig would be finished.

MORRIS FULTON.

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"Amateur Work and Ways."

Editor American Machinist:

Having read with interest the pertinent remarks on the above subject by Tecumseh Swift I feel that, although he has spoken the truth, there are certain limitations to an amateur's work which must not be overlooked. There are amateurs and amateurs. A man of mature years, with means to gratify his mechanical tastes, and the ability to execute them, should be ashamed of the jimcracks pottered together by the youth whose resources are, on the average, very limited.

There is an old saying that nothing succeeds like success, and I confess that it is more pleasure to look at an engine with a babbitt cylinder and a flywheel cast in a pill box which goes, and all the while you wonder how it can without falling to pieces, than at another whose parts are in good taste in every respect, but which has been abandoned before finishing for lack of patience, or which, when finished, was a failure.

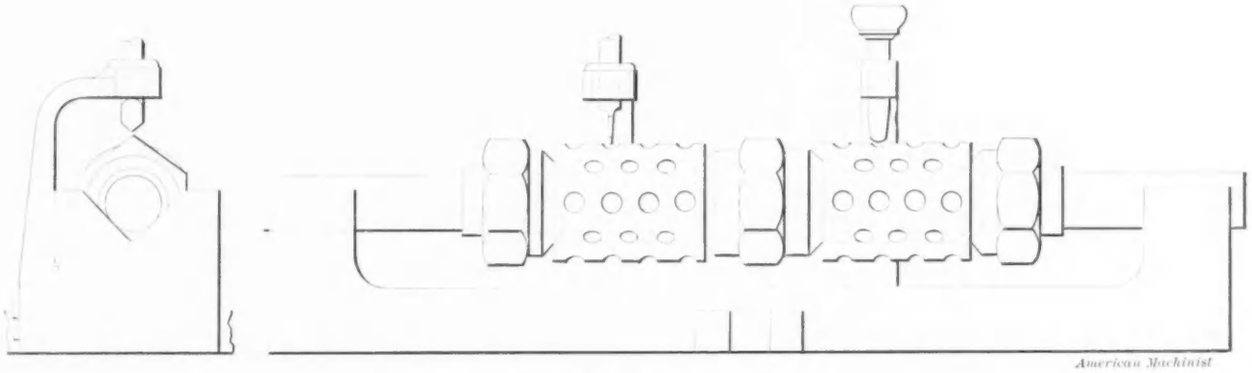
Mechanics are not amateurs and amateurs are not mechanics in the sense generally understood.

The tradesman, as a rule, has very little patience with the devices of the tinker, but the difference between the two, in a measure, lies in the fact that the amateur works for an end and secures it by the means easiest at hand, while the mechanic with his years of training, and the accumulated experience of the hosts before him, often places too much stress upon the means employed and forgets the end which is to be attained.

It should not be understood, however, that these crude devices are commended in themselves, but the impelling motive which seeks an outlet in making something that moves in a certain mechanical order. A bent wire turning in a hole through a cork may generate practically as true a circle as the finely made spindle of the precision lathe, and is not one mechanical as well as the other? The term unmechanical is often misused. A combination of finely made gears, shafts and levers may or may not be mechanical. If so assembled that no movement of parts is possible it is for the time being no more of a machine than a bronze statue of Red Jacket. Some sticks of wood glued together, a few bent wires, a little solder and what not will make a successful mechanical toy costing a few cents. A more elaborate construction is out of the question, and what seems decidedly amateurish in one place would be in the line of commercial practice in another. The work of the amateur should be estimated, first, according to the success of the mechanism as made, and, secondly, as to the manner of obtaining this result with the least number of parts, and these made and arranged in a way that appeals to mechanical taste.

FRED E. ROGERS.

Corning, N. Y.



ANOTHER RIG FOR DRILLING BUSHINGS.

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The Fischer Foundry and Machine Company, of Pittsburg, informs us that an interference case regarding certain patents on self oiling devices for engines has been decided in their favor, and that the decision affects the majority of builders of self oiling engines and will probably result in a modification of existing designs of this type of engine. We are informed by the Weston Engine Company, of Painted Post, N. Y., the other party to this interference suit, that though this decision of the Commissioner of Patents has gone against them, they by no means consider the case settled, but shall appeal to the courts and believe they will eventually win. Such cases are not usually settled until one side or the other gives up.

The Electrical Exhibition.

"All exhibitions are alike," and the present one at Madison Square Garden, in this city, is no exception to this rule. As a matter of course most of the exhibits are strictly commercial, and comprise machinery and appliances that are familiar to all, with a few novelties of educational interest.

As compared with the exhibition of two years ago, this one suffers in having had a previous one to set a high standard of comparison, and by the further fact that recent developments provide no such unique novelties as the X ray, the Niagara Falls, and the Moore system of vacuum tube lighting exhibits which were such centers of attraction two years ago.

Mr. Moore's exhibit of two years ago was hastily improvised, and his beautiful and well planned show this year is one of the most interesting of the entire exhibition. He has constructed a complete miniature chapel, with a grained arched ceiling, in which the tubes are incorporated as they are intended to be in use. The light shows a marked improvement in general effect, and especially in steadiness, but the extent of the illumination scarcely seems to us to be up to what is now demanded.

The Walker Company shows a full sized street car with a section of track fitted with the "underground trolley," which is open to view in all its construction. The current is connected, and the car is operated from time to time and gives an excellent means of understanding this construction. In fact, in an educational sense, the Walker exhibit is one of the best on view, being intended to show how the various appliances are made rather than how they look.

Of the novelties, Mr. Edison's magnetic ore separator takes a leading place. This is shown by a working model, and, while small, it gives an excellent idea of the working of this highly interesting system of ore concentration.

Another exhibit which was not possible two years ago is that of horseless carriages, of which three makers show samples of various types. These, of course, are all electrically driven from storage batteries.

An exhibit of a strictly educational nature is Mr. Schoonmaker's method of showing the lines of force in the magnetic field. Panes of glass with iron filings are superimposed over one another and show the character of the magnetic field better than we have before seen done. The filings are fixed in position so that the specimens are permanent, the fixing being done by a method which does not appear and is not explained.

Like all exhibitions, this contains many things which are more or less remotely connected with its direct object. Gas and oil engines are of course legitimately included in an electrical exhibition, and in addition to some which do not call for special comment, a 30 horse-power Hornsby-Akroyd engine, made by the De La Vergne Company, which, however, is not in motion, is noteworthy. A Diesel engine of 20 horse-power will also attract attention. This was not in motion on the occasion of our visit, but was expected to be in a day or two.

Of exhibits having no discoverable connection with electricity is a specimen of the linotype, which is constantly surrounded by a throng of sightseers, as it deserves to be, illustrating as well as anything can the universal attractiveness of mechanism in motion. To the many who have not seen this remarkable machine this exhibition furnishes an opportunity which should not be missed.

Alongside the linotype, and like it having no apparent place in the show, but being none the less interesting on that account, is a Sims-Dudley dynamite gun, which is said to have had a very important bearing on the progress of the war in Cuba. This gun is, in our opinion, one of the most remarkable of recent weapons of war, and it shows clearly that it is but a question of a little time when dynamite and not gunpowder will be the deciding factor in war. One of the most obvious features of the gun is its simplicity and consequent cheapness, and we cannot but hope that it, or some other dynamite gun, by making weak nations secure from aggression by strong ones and by introducing such carnage as to surpass the power of human nature to endure, will make war impossible. Those in control of the gun say that this has been its tendency in Cuba; that troops will not stand in front of it, while those serving it have been compelled to turn away sick at the horrible consequences of their work.

One of the most successful of the features of the exhibition is the illumination of the great hall. This is chiefly by arc lamps of the inclosed type, and the whole effect is brilliant and entirely free from flicker. It is impossible not to notice the great advances in the artistic construction, mounting and grouping of the lamps. Not long ago the arc lamp was among the ugliest things ever thrust in the face of heaven, while its mounting and suspension were, if possible, still worse, and the early attempts to produce an "ornamental" lamp would have been more successful if devoted to the production of scarecrows. The hall is surrounded by a row of real goose neck posts, with tasteful lamps suspended therefrom, and without evidence of conducting wires or hoisting apparatus, while the gigantic central electrolier is equally neat, simple and artistic, and occasional lamps on posts of equally attractive construction add variety to the methods employed. The transformation which a few years has brought, first from bald and then from ornate ugliness to simplicity and beauty, is most gratifying.

It is too early to speak positively, but so far the show does not seem to draw as did the one of two years ago. The evening of our visit was raining, and the exhibition is still young, while the Madison Square Garden is of course a much larger place to fill than the Grand Central Palace, but to those who remember the throngs who packed the latter named place almost to suffocation, and who formed in long lines to get a glimpse of the more attractive exhibits, this one seems very tame. Apart, too, from the question of public support, the absence of exhibits by some of the leading houses in the trade is conspicuous.

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American Foundrymen's Association.

Mr. John A. Benton, secretary of the American Foundrymen's Association, sends us a list of papers to be presented before the coming meeting at Cincinnati, June 7 to 10. The papers are as follows: "A Modern Foundry," by A. W. Walker; "The Micro-Construction of Iron and Steel," by S. S. Knight; "The Adoption of a Standard System of Test Bars for Cast Iron," by R. G. G. Moldenke, E.M., Ph.D.; "A Talk on Brass Founding," by Chas Vickers; "Manganese in Cast Iron," by Guy R. Johnson; "The Overhead Trolley Track," by H. M. Ramp; "Necessity of Well Mixed Furnace Casts and True Reports of Analysis," by Thomas D. West; "The Manufacture of Steel Castings," by Stewart Johnson; "A Test for Determining the Hardness of Cast Iron," by C. A. Bauer.

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An Invitation.

At a regular meeting of the Providence (R. I.) Association of Mechanical Engineers, to be held at the association's rooms, 54 North Main street, Providence, the evening of Tuesday, the 17th inst., at 8 o'clock, Mr. Fred. J. Miller, editor of the "American Machinist," will present a paper on "Impressions of European Machinery and Machine Shops from the Standpoint of an American."

The association hereby cordially invites all readers of the "American Machinist" who may find it convenient to do so to attend the meeting.

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It is announced that, beginning June 8, a summer school in manual training, wood work, forging, chipping and filing, and machine tool work will be opened at the Massachusetts Institute of Technology. Such a summer course was started in 1896 and has proved quite popular. It is intended not only for students of the institute, but for teachers and others who may feel the need of such instruction.

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Good Work in All Lines.

One of the persistent and widely prevalent bad habits of the trade is that of thinking that some lines of work require all through much more skill and care than others, that, in fact, almost anything is good enough, in design, material and workmanship, for the production of some large and important classes of machinery. The aristocrat of the trade, the high-toned mechanic—on his own estimate—the builder of steam engines, of lathes and planers and other machine tools, of printing presses, of dynamos and motors, is very apt to despise, for instance, the work of the agricultural implement maker. This is, no doubt, all wrong. An agricultural machine shop is quite as likely to be run into the ground by inadequate skill and careless management, by the crudeness and unreliability of its product, as a steam engine shop; and the catastrophe is also of quite as frequent occurrence. Moreover, it is a familiar fact to those who are well informed that some of the shops in this country where harvesting machinery is built are very well advanced in tool making, equipment and management of tool rooms and construction and use of special machinery, and could give valuable instructions in these matters to some of the shops that are much more pretentious.

The public has been very extensively victimized by the prevalence of the mistaken ideas we speak of. Where skill and care have not prevailed in the production of the original machinery of some of the despised classes it has been expensively compensated for in the large and constant requirements for repairs. Some lines of machinery have been permanently degraded by the idea that cheap and inferior methods of production were proper for them. In this line one of the best object lessons that we know of is one that is spread all over the country. Anyone who has done much traveling over the land cannot have failed to notice the number of dilapidated, demoralized and generally useless windmills that so frequently greet the eye. It is a rare thing to see a windmill in good running order which is not also evidently a new one. Instances are very numerous where pumping windmills have been abandoned for oil engines or steam engines or other motors, not because their service was not satisfactory when they were in running condition, but that they so soon get into a hopeless state of chronic derangement. There is no reason why it should not be as possible to produce a windmill adapted to the peculiar conditions under which it is to work as it is to satisfy the far more exacting conditions which the locomotive has to meet; yet we very well know that the less difficult task is the most rarely accomplished.

Only a few days ago we were favored in being permitted to look all through an establishment whose exclusive business is the manufacture of windmills. It will scarcely be credited, after writing the above, that we were very much surprised to find in the establishment referred to a really up-to-date and finely and thoroughly equipped machine shop. The surprise was a genuine but nevertheless an agreeable one, and yet we owe an apology to the enterprising proprietor for the fact that it was a surprise at all. Nothing could be offered by way of excuse except the very common and generally unsatisfactory statement of lack of specific knowledge and of neglect of means of information upon the subject. We had never thought of the exacting conditions which a good and lasting windmill must meet. The mere fact that a windmill will go when it is first set up is very far from affording an assurance that it will continue to go and constantly render good service. The windmill is an out of door apparatus, and must be made to face all weathers, but not more so than the masts and rigging of a ship. As a windmill it must be ready to run at all times when the wind blows, and while it will do its work, or a portion of it, in light breezes, it must not run itself to pieces in a heavy gale. A windmill needs a governor more than a steam engine does, and the governor must be more constantly acting. As the windmill runs when we are asleep as well as when we are awake, its working parts must be of suitable material and proportion, and reliable lubrication or anti-friction devices must be provided. It must run in sun and rain and frost all the year round, and it is pleasant to know that there are windmills that will do it, and they are those that are made not merely to sell but to meet all the vicissitudes of service; and to do this they are necessarily well made. It is not surprising that while the cheap windmills are an eyesore all over the land, the well made windmills are now being employed to drive electric motors, which in turn charge storage batteries, and by these the intermittent and always varying service of the wind is being transformed into a constant and reliable service such as we expect of a waterfall.

The windmill is only a sample. There are other lines of machinery where also the exacting conditions to be met are little thought of. Laundry machinery would probably be thought rougher and less exacting than windmill work; but those who know the repairs required in extensive laundries which have not the best class of equipment realize the need of honest work even there. Whatever the line of work there is for it both good and bad workmanship. Constant derangement indicates bad work necessarily. It is within human ability to produce reliable and lasting machinery for every service, and customers should be educated to insist upon it.

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When we have tight and loose pulleys and a belt to ship we naturally put the belt shipper as near the driven pulleys on the countershaft as possible. There are many mechanics who have never thought of putting the shipper anywhere else, and who probably could only with difficulty be persuaded to do so. As a matter of fact there are many cases in which, where the tight and loose pulleys are of the same diameter, with straight faces, and where very quick and frequent shipping of the belt is not required, it is much better to place the shipper near the driving pulley on the line shaft to operate on the belt as it approaches that pulley. We lately saw a punch with the tight and loose pulleys near the floor and the shipper attached to the beam overhead and operating on the upper end of the belt. The arrangement was neat, cheap and satisfactory.

Personal.

Passed Assistant Engineer W. B. Day, U. S. N., has been retired.

Acting Chief Engineer W. H. Levey, U. S. N., has been ordered to the "Solace."

Acting Engineer G. B. Terrill, U. S. N., has been ordered to the "Panther" immediately.

Acting Lieutenant W. M. Hopkins, U. S. N., has been ordered to the "Panther" immediately.

Chief Engineer A. Henderson, U. S. N., retired, has been ordered to the New York Navy Yard.

Acting Assistant Engineer G. A. Kolb, U. S. N., has been ordered to the "Panther" immediately.

A. R. Frye, U. S. N., has been appointed Acting Passed Assistant Engineer from April 30.

Passed Assistant Engineer J. A. Tobin, U. S. N., retired, has been ordered to the Norfolk Navy Yard.

A. Anderson, U. S. N., has been appointed acting assistant engineer and ordered to the "Illinois."

Thomas Brady, U. S. N., has been appointed acting assistant engineer and ordered to the "Illinois."

J. McNeal, U. S. N., has been appointed acting assistant engineer and ordered to the "Illinois."

John Anderson, U. S. N., has been appointed acting assistant engineer and ordered to the "St. Paul."

Assistant Engineer H. E. Rhoades, U. S. N., retired, has been ordered to the New York Navy Yard.

Chief Engineer R. G. Denig, U. S. N., has been detached from the Niagara and ordered to the Resolute.

Passed Assistant Engineer Charles H. Greenleaf, U. S. N., retired, has been ordered to the "Wabash."

C. F. Thompson, U. S. N., has been appointed acting assistant engineer and ordered to the "St. Paul."

E. S. Van Wart, U. S. N., has been appointed acting assistant engineer and ordered to the "Yankee."

Assistant Engineer J. A. Kaiser, U. S. N., retired, has been ordered to the League Island Navy Yard.

Assistant Engineer G. H. Shepard, U. S. N., retired, has been ordered to the Navy Station at Key West.

The opening story in "McClure's Magazine" for May was written by John A. Hill, of this journal.

W. G. Coxe, U. S. N., has been appointed acting passed assistant engineer and ordered to the "Illinois."

Acting Passed Assistant Engineer G. W. Campbell, U. S. N., has been ordered to the "Panther" immediately.

C. Robinson, U. S. N., has been appointed acting passed assistant engineer and ordered to the "St. Paul."

Assistant Engineer C. W. Livermore, U. S. N., retired, has been appointed assistant inspector of machinery at the Union Iron Works, San Francisco.

Chief Engineer Alexander Henderson, U. S. N., retired, has been appointed fleet engineer of the mosquito fleet.

Passed Assistant Engineer W. A. H. Allen, U. S. N., retired, has been ordered to the League Island Navy Yard.

Assistant Engineer W. H. P. Creighton, U. S. N., retired, has been ordered to duty with the tug "Mary Wittick."

Passed Asssistant Engineer James J. Barry, U. S. N., has been ordered to the New York Navy Yard immediately.

Chief Engineer E. Farmer, U. S. N., retired, has been appointed inspector of machinery at the Boston Navy Yard.

Chief Engineer R. W. Galt, U. S. N., has been detached from the Mare Island Navy Yard and ordered to the "Charleston."

Passed Assistant Engineer L. D. Miner, U. S. N., has been detached from the "Solace" and ordered to the Norfolk Navy Yard.

Mr. Robert Lang, of the firm of John Lang & Sons, machine tool builders, of Johnstone, Scotland, is visiting here in America.

Assistant Engineer M. H. Plunkett, U. S. N., retired, has been appointed assistant inspector of machinery at Newport News.

Gardner C. Sims, of Providence, R. I., has tendered his services to the Navy Department as engineer and has passed examination.

Assistant Engineer A. N. Procter, U. S. N., has been detached from the "San Francisco" and ordered to New York, with the "Corsair."

We welcome personal items regarding men connected with the machinery business. Kindly contribute what you can to this department.

Chief Engineer A. B. Willetts, U. S. N., has been detached as Inspector of Steel at Hurlow and ordered to the Bureau of Steam Engineering.

Passed Assistant Engineer John Pemberton, U. S. N., retired, has been appointed Assistant Inspector of Machinery at East Orange, N. J.

Assistant Engineer B. H. Warren, U. S. N., retired, has been ordered to Nunthal, Pa., as assistant inspector of steel for the Pittsburg district.

Passed Assistant Engineer J. C. Kafer, U. S. N., retired, has been appointed inspector of machinery at the Quintard Iron Works, New York.

Passed Assistant Engineer G. E. Burd, U. S. N., has been detached from the League Island Navy Yard and ordered to the New York Navy Yard.

Mr. George W. Lake has resigned his position as foreman with the Providence Steam Engine Company, of Providence, R. I., to take general charge of all machine departments of the American Ordnance Company's works at Lynn, Mass.

Passed Assistant Engineer C. H. Emrich has been detached from the New York Navy Yard and ordered immediately to the "Southerby."

Passed Assistant Engineer F. H. Conant, U. S. N., has been detached from the New York Navy Yard and ordered immediately to the "Resolute."

Assistant Engineer E. S. Kellogg, U. S. N., has been detached from the New York Navy Yard and ordered immediately to the "San Francisco."

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Inquiries for Machinery.

Those who make, or may know of the makers of such machinery as is called for below, will oblige us by sending name and address, mentioning the number of the inquiry. We cannot forward catalogs. We have inquiries as follows:

54—For makers of mitis or wrought iron castings.

55. From Mexico for makers of machinery for coiling copper tubes such as are used in the manufacture of stills.

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The Bethlehem Iron Company has received an order for thirty-five 5-inch rapid fire guns for the army, and also for forgings for forty small guns to be finished at Watervliet and Bridgeport.

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Some further particulars regarding the contract signed between the Cramps of Philadelphia and the Russian Government for two naval vessels, a battleship and a cruiser, give as the approximate displacement of one of these vessels (the battleship) 12,500 tons, to have a guarantee speed of 18 knots per hour during a trial trip of twelve hours duration at load draft and carrying 1,000 tons of coal. The other vessel is to be a protected cruiser of about 6,100 tons displacement, and to develop a speed of 23 knots per hour under the same conditions and carrying 725 tons of coal.

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Commercial Review.

NEW YORK, Saturday Evening, May 7, 1898.

THE ENGINE MARKET.

A retrospect over a month past in the business department of the engine and boiler industry affords ample exemplification of the retarding effects of recent public turmoil. The dark spectacle is diversified, however, with several bright features, and of late circumstances are developing that prognosticate a brilliant future if public matters continue their reassuring trend.

The unfavorable feature is the same that we have many times called attention to already, an unwillingness of industrial investors to go ahead and place their pro-

posed contracts. The dearth of orders that results is the occasion of decided comment among sellers. And yet the proportion of those companies that have not thus far felt this shrinkage in trade is larger than might be supposed.

It is fortunate that the war has come as quickly as it has and is moving along as rapidly as it is—however much slower that may be than some would have it—because the contracts that arrived a long while ago are enabling some engineering companies which are not booking much new business to keep well employed in the execution of old orders. If peace comes again soon it is possible that a flood of delayed contracts may be let loose in time to avoid any great shutting down of works, even supposing a continuance of the war would cause a widespread closing of shops, which is not certain.

It looks as if machinists would not suffer for want of plenty to do, war or no war. There is now talk of having to pay higher prices for skilled labor, and we understand that at least one company engaged in building engines and other machinery has begun doing so already.

A Favorable Reaction.

More than one discriminating judge of the steam power lines of industry informs us that within the last fortnight business has materially changed for the better. The war was thoroughly discounted beforehand, and now that it is under way people draw a breath of relief. They know which way the die has been cast, and yet they find that the sun rises and sets just as often and things outside of their office windows look just the same in times of war as in times of peace. Hence they are beginning to settle down to business upon a war basis in very much the same way as upon a peace basis. It is a result of this, no doubt, that the said observers can tell us of more inquiry for engines and boilers for manufacturing establishments, of a wholesome, industrial character during the last ten days than for many weeks previous.

A member of a certain prominent engineering firm bears testimony to this sudden revival of trade and the contrast between the past ten days and the previous two months. He states that the reaction is the most remarkable he has ever observed, and that the amount of business that it has brought in the shape of actual contracts has been immense. He attributes it to the public confidence inspired by the victory of Dewey and the assured prospect of a successful termination of the war. He considers that the prospects offered by the future are eminently flattering.

Engine Prices Advanced.

A certain high-speed engine company has lately made an advance of 10 per cent. in the price of its engines. The company is rushed with work at present, and that appears to have had more to do with the increase than any desire to establish war prices. This advance would have been a memorable event at any time within the past five years. Now it is peculiarly encouraging.

A 10,000 Horse-Power Boiler Contract.

The Lorain Steel Company, Lorain, Ohio, has purchased for its new plant 10,500 horse-power of boilers, to be made by the Aultman & Taylor Company. About one-half will be of the Cahall vertical type, and will be used in operating the two new blast furnaces. The remainder will be of the horizontal water tube type, and be employed in connection with the new blooming mill and coke ovens. The contract was negotiated through the agency of Edgar C. Moxham & Co., of this city.

A Flurry in High-Speed Engines.

Another favorable report that can be made is that during the past few weeks of dearth some, at least, among the engine companies have been able not merely to hold their own, but to flourish and grow fat. This is particularly in connection with isolated plant electric lighting work.

The Weston Engine Company has had a remarkably heavy rush of orders of late, by far the greater part being for direct connected electric lighting engines. The works are now running at fullest capacity, and are about 40 engines behindhand, amounting in time to twelve or thirteen weeks. An addition to the machine shop is being erected. We understand that tools for use in it are already secured, although more may be required in the course of a few months.

The Watertown Engine Company was reported recently as having enjoyed an excellent and increasing trade in spite of the war. A number of late sales are mentioned.

The Ames Iron Works have succeeded in securing, within a short time past, a very good amount of lighting engine work, in fact more than the amount ruling previously.

Miscellaneous Contracts.

The Cleveland Edison Illuminating Company, Cleveland, Ohio, will install two 1,250 horse-power McIntosh & Seymour engines to be directly connected to 800 kilowatt General Electric dynamos. We have heard of a late purchase of two 450 horse-power engines of the engine firm above alluded to, for factory purposes.

We are informed that the large business of the E. P. Allis Company is going right on as ever undisturbed by the war. The Sheffield Tramways Company, Sheffield, England, has cabled for three 300 horse-power engines of this make, and it is stated that the dynamos used with them will be purchased through the British Thompson-Houston Company.

A Government contract in the boiler line is for 350 horse-power of the return tubular type, required by the Boston navy yard. Bids were to be received on the 3d of this month, but we have not heard that a selection has yet been announced.

Four hundred horse-power of Ideal engines, made by the Harrisburg Foundry & Machine Works, will be installed in the printing house of the New York Life Insurance Company to furnish light and also power to drive presses. About 250 horse-power of the same make have been purchased for the Martinique Hotel, of this city. Three engines were recently shipped to Japan.

The Frick Company, Waynesboro', Pa., is reported as busy upon its various lines of machinery. Its ice and refrigerating machinery, which is handled largely through the New York office, is selling better than ever in spite of the war. Among the latest sales was a refrigerat-

Continued on page 33.

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Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Conn.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y.

Cutters, reamers and small tools, regular and special; vertical millers, cutter and surface grinders, shears and punches. R. M. Clough, Tolland, Conn.

Situations Wanted.

Experienced mech'l draftsman. Box 7, Am. Mach.

Foreman wishes position; machine or tool room; reference. Address Box 41, American Machinist.

Experienced mechanical d'ftsman, tech. graduate, references, desires position. Box 31, Am. Machinist.

Foreman of screw mach.; wide exp. on mach. screw elec. and bicycle parts; A1 refs. Box 34, Am. Mach.

Foreman wishes to make change; fam. with interchangeable, model or tool work; ref. Box 24, Am. Mach.

Blacksmith—First-class toolm'k'r, understands hardening and tem. thor'ly, desires pos. Box 35, Am. Mach.

Die and tool maker, A1, accurate work, large experience, take ch'ge if required, wants sit. Box 45, Am. Ma.

A thoroughly reliable M. E. wants position as superintendent of machine shop; good designer; best references. Address Box 40, American Machinist.

Experienced locomotive and car designer desires to change; eight years' practical experience also as mechanical engineer. Address Box 38, Am. Machinist.

Engineer, technical graduate, with shop and drafting room experience desires position with well estab. firm; moderate salary; A1 ref. Box 37, Am. Mach.

A shop superintendent of one of the most successful turret lathe builders desires a change; nine years in present position; best ref. Box 229, Am. Machinist.

Situation Wanted—As factory manager or superintendent, by prac. mech.; well posted on modern shop methods; mem. A. S. M. E. Address Box 29, Am. Mach.

Position Wanted—By a blacksmith and a machinist with reliable firm; each thoroughly competent to take charge; ages 30 and 27. Box 26, American Machinist.

Wanted—Position as foreman or assistant superintendent, by a practical man; experienced on typewriters and sewing machines; can design and produce work cheaply. Box 36, American Machinist.

An up-to-date foreman wants position with some engine or steam pump concern; can get work out quickly; good hustler; habits and references O. K.; been with the largest concern in the country. Box 30, American Machinist.

Head foreman of machine tool building company desires a change; will accept position as foreman or assistant superintendent; familiar with modern machine shop methods; held present position nearly ten years; habits and reference O. K. Box 227, Am. Mach.

Parties desiring the services of a factory manager are respectfully requested to correspond with the undersigned, who has had extensive experience and is familiar with modern methods of factory management, a practical mechanic, thoroughly posted on the best practice in machine shops, foundries and kindred departments, having held every position along the "line" in various lines of manufacture; salary or a percentage. Address Box 39, American Machinist.

Help Wanted.

Opportunity for a man familiar with machinery and supply trade. Box 33, AMERICAN MACHINIST.

Wanted at once 50 first-class tool makers. Driggs-Seabury Gun & Ammunition Co., Derby, Conn.

Wanted—Draftsmen, experienced in sugar mach. Address E. B. I. W., 54 Beard St., Brooklyn, N. Y.

Draftsman wanted—One well acquainted with mod. stat. and marine engines. Apply Box 22, AM. MACH.

Wanted—A man who thoroughly understands reading drawings, of good executive ability and business training. Address, with ref., Box 234, AM. MACHINIST.

Wanted—Ten competent lathe, vise and planer hands; first-class men wanted only; experienced in dynamo work preferred. P. O. Box 374, Cincinnati, O.

Wanted—Capable draftsman, who understands construction of paper and pulp machines. State salary expected and experience. Immediate engagement. Box 43, AMERICAN MACHINIST.

Wanted—Foreman for machine shop employing fifty hands, on Corliss, high-speed and marine engines; first-class man of experience only need apply. Box 23, AMERICAN MACHINIST.

Wanted—One first-class blacksmith for machinery forging, both heavy and light; to a first-class man steady work and good wages will be paid. Address Box 8, AMERICAN MACHINIST.

Wanted—A few expert tool makers on light work; steady employment and fair pay will be given good men; state age and experience and give references. The L. S. Starrett Co., Athol, Mass.

Wanted — Experienced young foreman pattern-maker; expert in green sand and loam work patterns; good manager of men: give experience, references, salary required. Address Box 28, AM. MACHINIST.

Wanted—A few good machinists for accurate bench work; moderately light machinery. Apply by letter with references, and state exp. and wages desire The Westinghouse Mach. Co., Box 452, Pittsburg, Pa.d.

Wanted—A good boiler maker that has some experience in laying out work, who can also do ordinary blacksmith work, for a small machine shop located in a prosperous city of Montana. Address Box 27, AM. MACH.

Wanted—Competent man to sell injectors; one who has had experience and understands the different points of the principal injectors on the market; in answering give full particulars. Ad. Box 32, AM. MACH.

Wanted—Superintendent of forge shop accustomed to and capable of handling 100 men and getting out work in quantities by large and long established manufacturing company in Chicago. Address Mercantile Exchange, Chicago.

On machine tool work, one good draftsman and one first-class pattern maker, by a company located in a small New England town; state experience and salary, or wages; habits must be good. Box 16, AMERICAN MACHINIST.

Wanted—Supt. for machine shop; 100 to 125 hands; Western location; general line of mach. and mill appliances. Want man of exp. and thoroughly posted on modern practice. State exp. and salary expected, and give refs. Address Box 46, AMERICAN MACHINIST.

Wanted—An energetic, leading draftsman, experienced on automatic machinery, by a concern located near New York City; must be quick and accurate and at present employed. Steady position and fair salary to right person. State particulars. Address Box 44, AMERICAN MACHINIST.

Wanted—A foundry superintendent on high-grade machine tool castings. Must be a progressive, broad gage man. Salary commensurate with ability and results. First-class foundry and equipment Must know how to make good castings. Address, if this fits you (not otherwise), Box 42, AMERICAN MACHINIST.

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Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Shop agents wanted for book on Dies and Die Making. Book, Dies & Die Making, $1. J. L. Lucas, Prov. R. I.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Wanted, by Hartford, Conn., Public Library, Am. Machinist, Vol. XVI, No. 48, for which 25 cents is offered.

For Sale—Second-hand drill presses, engine lathes and planers. Dietz, Schumacher & Boye, Cincinnati, O.

For Sale—American No. 2 gas case hard. furnace and No. 2 pressure blower; half price. Durbrow, 12 Wooster Street, New York.

Wanted—Bound or unbound volumes of American Machinist from January, 1890, to March 31, 1897. Address Box 21, AMERICAN MACHINIST.

Advertising Novelties Wanted—We will buy patents, manufacture for patentee or on a royalty, good advertising novelties Address P. O. Box 125, Erie, Pa.

Agency—An engineering office in Holland desires to represent first-class American mfrs. of metal and wood working machinery. Address Box 25, AM. MACHINIST.

Lathes, planers, drills, milling machines, vises, also brass working machinery second-hand; must be modern and in first-class condition. C. C. Wormer Machinery Co., Detroit, Mich.

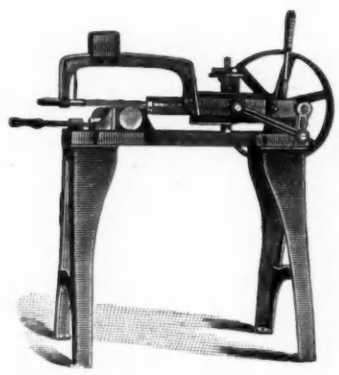
The advertising department of the American Machinist has on hand 20,000 draftsman's thumb tacks; will send a box of ten to any draftsman in America on request; could use a postage stamp on box, but will send the tacks anyway.

"The best is as good as any."

The New

Automatic and Gravity Feed

Q & C Shop Saw



Cuts { Tool Steel, Machinery Steel, Iron, Brass and All Other Metals.

Price—'Way Down.

Quality—'Way Up.

Shop Saws,

Portable Rail Saws,

Cold Power Saws,

For All Purposes.

Send for Catalogue.

Q & C Company,

Chicago. New York.

LONDON: Chas. Churchill & Co.
PARIS: Hounsfield & Fils.
BERLIN: Schuchardt & Schutte.
MADRID: J. G. Neville & Co.

Continued from page 32.

ing and ice machine of 20 tons capacity, destined for Japan.

Cincinnati Report for April.

In the line of machine tools business has been remarkably good. As in past months the greater part of it has been foreign trade. That is true also of woodworking machinery. Tool builders are, in the main, very busy, working from 12 to 15 hours a day. There has been more doing in home trade. Inquiries, both domestic and foreign, are many, showing an increasing demand. The war with Spain has not seemingly affected the market for machine tools, engines and other machinery.

The J. A. Fay & Egan Company has been making shipments from Seattle for Russia; from Portland, Ore., for Japan; from New York for England, and from Newport News for France. The declaration of war occasioned some anxiety for the machinery thus intrusted to the high seas, but since the steamers on which it is shipped sail under foreign flags the fear for its safety is passing away.

Crawley & Johnston have an order from the United States Government for one of their automatic steering gears, to be used on the steamer "Minnetonka."

The Lunkenheimer Company has received several large Government orders for supplies for navy yard use.

The Bickford Drill & Tool Company's business for the month of April has exceeded that of any other month in the history of the establishment. It is about equally divided between home and foreign trade, and is necessitating 15-hour time in the shops, which is likely to be continued for some time to come.

The Sebastian Lathe Company has thus far had a very busy season. Home trade has been excellent. Foreign has also been good, with increasing inquiry of late and a large order for machine tools just received from Berlin.

The American Tool Works Company has an order from Paris for between six and seven carloads of machine tools. Last week it shipped five carloads of machine tools to Europe, and was expecting to send eight carloads more in the same direction this week.

A. Streit & Son have an order for 100 machine pulley turnings and several orders for boring machines.

Houston, Stanwood & Gamble have found the first four months of this year the best they have known in some years. They have a fine Southern trade and some export business. Some shipments are being made to Mexico.

M. L. Anderson & Co. have late orders from Germany and a good many home ones. They say that their April business in the West and Northwest has been remarkably good.

J. M. Robinson & Co. have a number

of orders for heavy machinery for manufacturing iron and steel roofing, etc.

Louis E. Rechtin & Brother are receiving many small orders for machinery, and find an increase of 30 per cent. for the first four months of this year as compared with the corresponding period in 1897.

J. Steptoe & Co. find business very brisk. They have orders from Russia, Germany, Africa, Japan and Australia, besides many domestic ones.

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Quotations.

NEW YORK, Monday, May 9.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 00 @ 11 50
No. 2 foundry, Northern	10 50 @ 11 00
No. 2 plain, Northern	10 00 @ 10 50
Gray forge, Northern	10 00 @ 10 50
No. 1 foundry, Southern	10 75 @ 11 00
No. 2 foundry, Southern	10 25 @ 10 50
No. 3 foundry, Southern	10 00 @ 10 25
No. 1 soft, Southern	10 75 @ 11 00
No. 2 soft, Southern	10 25 @ 10 50
Foundry forge, Southern	9 75 @ 10 00

Bar Iron—Base—Mill price, in carloads, on dock. Common, 1.07½ @ 1.10c.; refined, 1.15 @ 1.20c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.30 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @ 7c., with some grades perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.45c.

Cold Rolled Steel Shafting—Base sizes, from store, 2.15 @ 2.20c., according to quantity.

Copper—Carload lots: Lake Superior ingot, 12¼c.; electrolytic, 11⅞ @ 12c.; casting copper, 11⅝ @ 11¾c.

Pig Lead—Carload lots, 3.67½c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 14.60 @ 14.70c.

Spelter—Carload lots, 4.20c., New York delivery.

Antimony—Cookson's, 9¼ @ 9½c.; Hallett's, 8½ @ 8¾c.

Lard Oil—Prime city, present make, 48 @ 50c. in wholesale lots.

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Manufacturers.

Mr. Alonzo G. Collins has moved from 608 to 1301 Pabst Building, Milwaukee, Wis.

The plant of the Brown Machine Company, Winsted, Conn., was recently burned out.

Charles G. Eckstein & Co. have removed from 45 Vesey street to 249 Centre street, this city.

The factory of North Brothers, Philadelphia, Pa., is to have an addition 40 feet square built.

At Dexter, Me., the firm of Amos Abbot & Co. will erect an addition to their woolen mill, 56x104 feet.

The R. M. Hollingshead Manufacturing Company, of Camden, N. J., is to erect an addition to its plant.

The Canfield Rubber Company, Bridgeport, Conn., contemplates the erection of an addition to its plant.

The Troy Laundry Machinery Company, of Chicago, has purchased ground, and will erect machine shops.

Powers & Walker, Grand Rapids, Mich., are to make additions to their plant and install modern equipment.

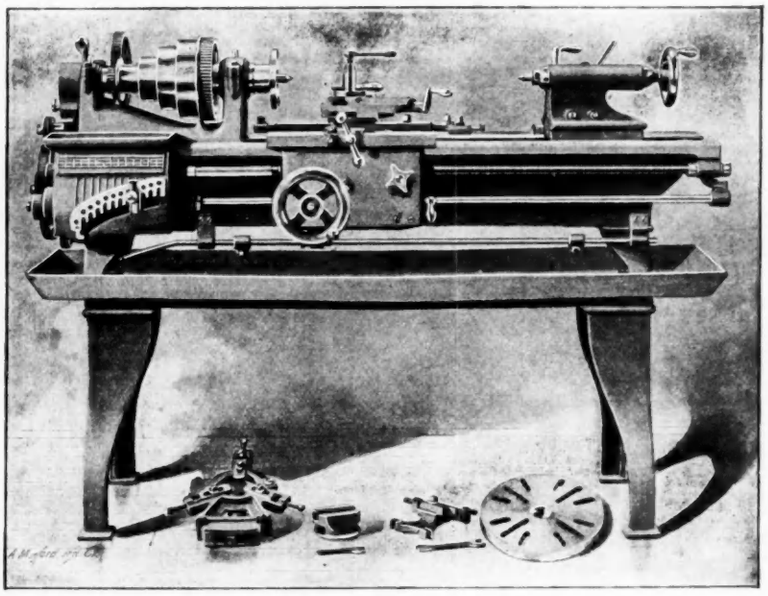
Work has been commenced on the new power house at Milldale, Conn., by the Meriden, Southington & Compounce Tramway Company.

The capital stock of the Woburn (Mass.) Light, Heat & Power Company is to be increased, and a new station is to be erected and equipped.

The Kirkham Tile & Pottery Company's plant, at Barberton, Ohio, which was destroyed by fire two years ago and which has lain in ruins ever since, will be rebuilt and made larger.

The Dallenbach Gas & Gasoline Engine Company, of Pittsburg, Pa., has been incorporated by Charles Sherriff, A. G. Dunbar and A. M.

12-in. Hendey-Norton Tool-Room Engine Lathe.



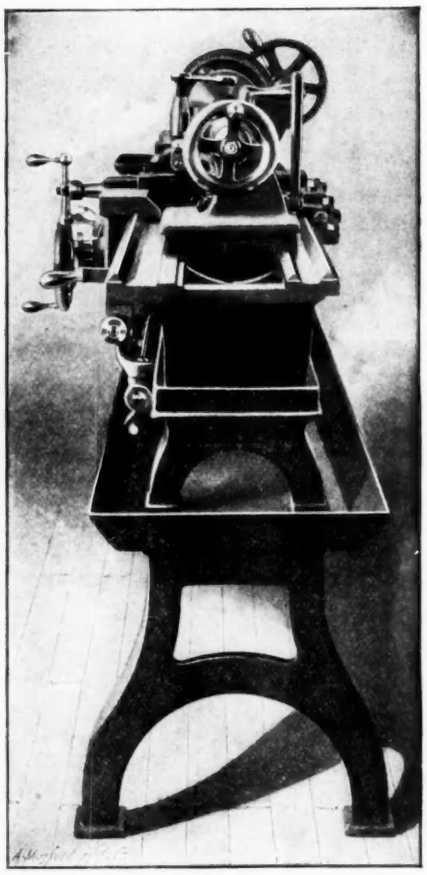
Complete in every respect as our larger sizes of lathes.

Especially designed for work in tool-rooms, experimental stations, and fine machine and repair shops. Fitted with either rise and fall or plain carriage. With or without improved taper attachment in connection with plain carriage.

This Lathe can be fitted with wire chucks in any decimal under half inch, which are invaluable for finishing small taps, reamers, special screws and studs, and other work right from the rod—no cutting off and centering of work required.

Cross-feed screw graduated to thousandths of an inch.

Beds made in 4 ft., 5 ft., and 6 ft. lengths.



END VIEW OF THE HENDEY-NORTON ENGINE LATHE.

The Hendey Machine Co.,

TORRINGTON, CONN.

Agents for the Pacific Coast: Pacific Tool and Supply Co., San Francisco, Cal.
J. W. Cregar, Philadelphia Bourse Exhibition.

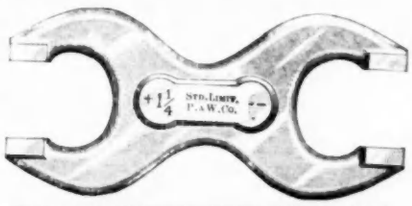
European Agents: Schuchardt & Schutte, Berlin, Vienna, Brussels, Stockholm; Chas. Churchill & Co., Ltd., London and Birmingham, England Adolphe Janssens, Paris, France.

STANDARD GAUGES.

If your BOLT IRON is not uniform in diameter when received in one lot or at different times and causes annoyance in adjusting your heading or threading dies and expense, when too large, for more weight than is required, you can protect yourself by buying and using, to test iron, as delivered, BAR IRON LIMIT GAUGES made by the undersigned. If your PIPE and FITTINGS WON'T CONNECT WITHOUT RETHREADING, you can use PIPE THREAD GAUGES, BRIGG'S STANDARD, to test them on receipt.

The manufacturers have the gauges and will use them rather than have their goods rejected because not made to the gauges when so ordered.

Illustrated in Gauge Catalogue.



THE PRATT & WHITNEY CO.,
Hartford, Conn., U. S. A.
New York: 123 Liberty St. Boston: 144 Pearl St.
Chicago: 42 South Clinton St.

ENGINE and SPEED LATHES

IN VARIOUS LENGTHS—9 to 15 in. SWING.
Latest and Most Approved Designs. Workmanship, Material and Finish of the Highest Order.

SEBASTIAN LATHE COMPANY,
117 and 119 Culvert Street, CINCINNATI, OHIO, U. S. A.
Agents: SELIG, SONNENTHAL & CO., London, Eng.; JOHN TAGARDH & CO., Göteborg, Sweden; E. SONNENTHAL, JR., Berlin, Germany; R. S. STORVIS & ZONEN, Rotterdam, Holland.

Fourth and Revised Edition. Second Thousand. 8vo. xii.+612 pages, 150 figures. Cloth, $5.00.

A Handbook of Engine and Boiler Trials,

And of the INDICATOR AND PRONY BRAKE. For Engineers and Technical Schools.
BY R. H. THURSTON.
JOHN WILEY & SONS, 53 East 10th Street, New York City.

SHELL AND SOLID REAMERS

WITH PATENT SPIRAL FLUTES.
Arbors, Mandrels, Taps, Dies, Screw Plates, Tap Wrenches, Bolt Cutters, Drilling Machines, Etc.

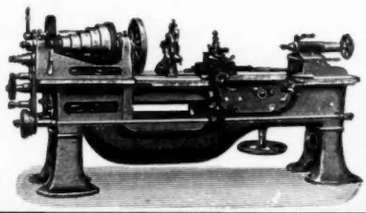
SEND FOR CATALOGUE.

Wiley & Russell Mfg. Co.
GREENFIELD, MASS., U. S. A.
Agents in London: SELIG, SONNENTHAL & CO., 85 Queen Victoria St.

PUTNAM MACHINE CO.,

The Oldest and Most Extensive Builders of Lathes in America.

LATHES, PLANERS, DRILLING MACHINERY, MILLING MACHINES, SLOTTERS, SHAPERS, GAP ENGINE LATHES.



RAILROAD SHOP TOOLS, GAP PATTERN MAKERS' LATHES, &c.
Correspondence Solicited.
8 to 100 Putnam St.
Fitchburg, Mass., U. S. A.

WE CLAIM THE FOLLOWING MERITS FOR **JENKINS BROS.' VALVES.**

1. Manufactured of the best Steam Metal.
2. No regrinding: therefore not constantly wearing out the Seat of the Valves.
3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
4. The Easiest Repaired, and all parts Interchangeable.
5. Every Valve Tested before leaving the factory.
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HINDLEY AND ALBRO Worm Gearing.

Order promptly—as our naval orders keep us busy.

Albro-Clem Elevator Co.,
Philadelphia, Pa.,
U. S. A.

McCandless, of Pittsburg, and others. The company proposes to erect a plant at Ellwood City, Pa.

B. N. McCoy Glass Company, Kane, Pa., will largely increase the capacity of its plant. Construction of the building is already in progress.

Preliminary plans are being prepared for a large electrical plant to be erected at Hightstown, N. J., for the Electric Light & Power Company, of that place.

Articles of incorporation have been filed in the Camden (N. J.) County Clerk's office by the Latrobe Steel Coupler Company. The capital stock of the company is $300,000.

Stephens & Handley, Boston, Mass., have purchased the property of George Morse, at Natick, Mass., and which they will improve and remodel for manufacturing purposes.

Contractors are figuring on plans for a furnace manufacturing plant, to be erected on Jefferson street, Toledo, Ohio, by George Auer. The building will cost about $6,000.

Robinson Machine Company, Monongahela, Pa., has been incorporated; capital, $40,000. Directors—J. A. Anderson, Samuel B. Robinson and Thomas E. Scraggs, Monongahela.

The Verity Manufacturing Company, Portland, Mich., will make extensive alterations in its plant. It has determined to build a three story addition to the rear of its factory.

The Hamilton Door Manufacturing Company, of Middleport, N. Y., has been incorporated; capital, $10,000. Directors—H. A. Hamilton, William Hogg and C. H. Creamer, Buffalo.

George Bentley, contractor, has submitted plans for a two story brick factory, 40x75 feet, for Henry F. Mitchell, of 1012 Passyunk avenue, at Eighth and Kimball streets, Philadelphia.

At Niagara Falls, N. Y., the Carbide Lighting Company has been incorporated. The directors are J. P. Devine, Buffalo, N. Y.; J. B. Rice, J. C. Frost, Niagara Falls, and Fred Overburg, New York city.

Articles of incorporation for the Lakeside Malleable Iron Company, Racine, Wis., have been filed. The capital stock is $17,000, and the incorporators are William Horlick, David G. Janes and Thomas T. Wood.

The Rigby Manufacturing Company, of Pittsburg, Pa., has been organized by E. F. Austin and P. H. Weaver, of Pittsburg, and the Rigby Brothers, of Wheeling. The company will erect a plant in or near Pittsburg.

It is reported that the Newport News Shipbuilding & Dry Dock Company will build as soon as possible four passenger steamers intended for coastwise service, two to the order of the Morgan Line and the other two for the Cromwell Line.

Ground has been broken for a new 207x45 foot brick building by the Springfield Drop Forging Company, at Brightwood, Mass. The new building will nearly double the capacity of the company, and is built to inaugurate a new branch of work. The new part will be devoted to a machine shop for finishing forgings.

The Hatch cutlery plant, of South Milwaukee, Wis., which was partly destroyed by fire three years ago, and which has been in litigation ever since, has been purchased by a syndicate represented by Carroll Atwood, Fred W. Rogers and H. M. Green. The plant will be immediately rebuilt and used for the purpose of manufacturing cutlery.

The United States Projectile Company, of Brooklyn, N. Y., has in the past week placed orders with the American Tools Works Company, of Cincinnati, for a number of 22 and 24 inch lathes. The American Tool Works Company has also received, through their office at Vienna, Austria, an order from the Oesterreichische Schuckert-Werke for a number of boring mills, planers, lathes and drill presses. It has also received, through its office at St. Petersburg, Russia, an order for a number of large lathes and planers from W. Pravlanica Obschchestwah Istee-inskich Metallourgeetches-

kich Mechahneecheskich Sahvodoff, one of the largest iron works in Russia, as its name indicates.

W. J. Davidson & Co.'s iron works at Port Richmond, S. I., are being enlarged by the erection of another building, 50x170 feet, two stories high, to be used as a machine shop.

The Moline Malleable Iron Company, at St. Charles, Ill., will erect a brick building 80x150, adjacent to its foundry this spring. A large force of men will be added when the new building is ready for occupancy.

Articles of incorporation have been filed by Rhodes Pneumatic Valve Company, Duluth, Minn. The incorporators are John G. Howard, Hiram N. Rhodes and Edward C. Howard, and the capital stock is placed at $10,000.

The Bellefonte Iron Works and Kelly Nail Mill, of Ironton, Ohio, and the Norton Iron Works, of this city, will erect a rod mill in connection with their steel plant at Ashland, Ky., and have invited bids for the building and machinery.

A large steel plant is to be erected at Woodson, Pa., by a newly organized company under the name of Wood's Sons' Steel Company, and the company is composed of Alan Wood & Co., of Philadelphia; Wellsville Plate & Sheet Iron Company, and J. Wood Brothers, of Philadelphia.

The Automatic Turning & Sewing Machine Company, of St. Paul, Minn., has been incorporated with a capital stock of $15,000. The object is to manufacture turning and sewing machines. The incorporators are Herman Nederman, of St. Paul, and Herman Poan and J. C. Fulton, of White Bear.

Arbuckle & Ryan are figuring on erecting a big steam plant for the Detroit and Toledo (Ohio) electric road. Mr. Shaffer, a Chicago capitalist, is one of the promoters of the enterprise, and has charge of the construction of the road. He will let the contract for the erection of the plant about April 25.

▲ ▲ ▲

New Catalogs.

There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9" size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.

The Mossberg & Granville Manufacturing Company, Providence, has sent us a copy of roller bearing supplement to its general catalog.

Eaton & Glover, of New York, have sent us catalog of the Eaton-Engle engraving machines for engraving on glass, silver, gold and other materials. The catalog is illustrated and contains samples of type capable of being used on the machine. It is 4¼x6¾ inches.

We have received from the Davis & Egan Machine Tool Company, Cincinnati, Ohio, a catalog of machine tools. This catalog is very complete, and contains tables and other data of interest to users of machine tools. It contains 380 pages, and is 4¾ x 6½ inches.

The Emerson Company, of Baltimore, Md., has sent us catalog of the Emerson automatic compression dry kiln for drying timber. The catalog describes the process very minutely and also contains photos of kilns fitted with this apparatus. The catalog is bound in morocco and is 5x6½ inches.

We have received from the Monarch Manufacturing Company, Waterbury, Conn., catalog illustrating and describing the "Monarch" engine stop and automatic speed limit, a device for the stopping of steam engines from different points, near or remote from the engine room, by simply pressing an electric button, or automatically. The catalog is 5½x8½ inches.

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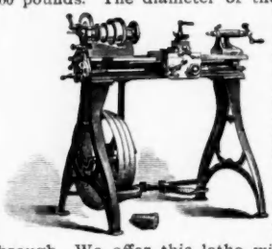

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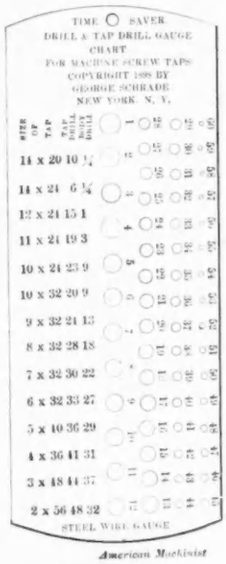
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FOR MACHINE SCREW TAPS
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TAP DRILL
CLEAR DRILL
14 x 20 10 ¼
14 x 24 6 ¼
12 x 24 15 1
11 x 24 19 3
10 x 24 23 9
10 x 32 20 9
9 x 32 24 13
8 x 32 28 18
7 x 32 30 22
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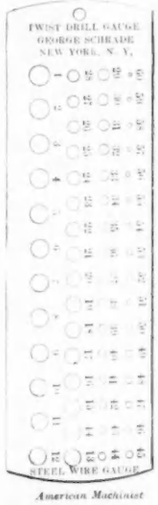

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Drill and Tap Drill Gauge chart fills a long felt want; does away with guessing when a drill is needed for a tap or body of a screw. The tap drill sizes usually found in catalogues are for a full thread, which necessitates working the tap through very slowly, and very often is the cause of broken taps. In all kinds of manufacturing where screws are put in to stay the thread need not be full. The sizes on chart are chosen after ten years' experience with taps and work where one tap is used to complete the threading, instead of two (taper and plug). There is no danger of breaking taps in annealed tool steel where the sizes of drills are chosen according to the chart. The gauges are made on special machinery, by experienced workmen, from the most suitable material, hardened and polished. Special charts and gauges made to order. Chart, $1.50; Drill Gauge, $1.00. Mailed on receipt of price. Sent on trial to responsible parties. Discounts to the trade.

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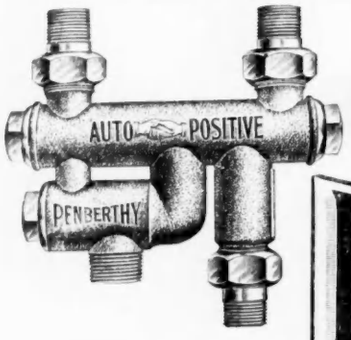

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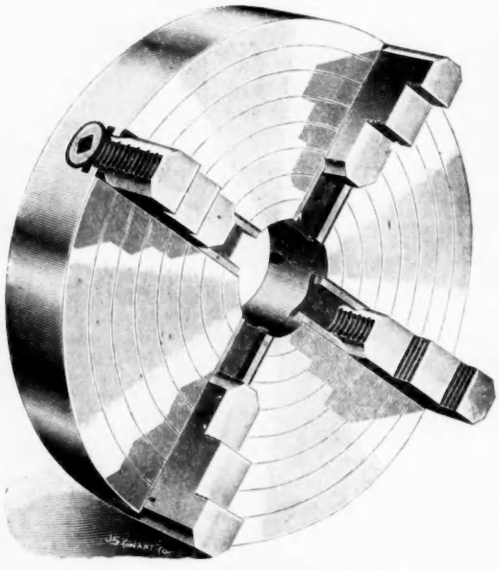

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84 in. x 21 ft. Wilmarth triple geared, very heavy.
70 in. Newark pulley lathe, 2 tools, good as new.
62 in. x 22 ft. Putnam Machine Co., triple geared, fine order.
60 in. New Haven pulley lathe, 2 tools and all attachments.
32 in. x 15 ft. New York Steam Engine Co., triple geared.
25 in. x 10 ft. Pratt & Whitney, P. G. rest and P. C. feed.
22 in. x 12 ft. Bogart, P. G. rest, P. C. feed and taper attachment.
21 in. x 10 ft. Fifield, C. rest and P. C. feed.
19 in. x 8 ft. Lodge & Barker, C. rest and P. C. fd.
16 in. x 8 in. Bogart, raise and fall weight rest.
14 in. x 6 ft. ditto.
14 in. x 6 ft. Lodge & Davis, C. rest and P. C. feed.
14 in. x 6 ft. Reed raise and fall rest.
13 in. x 5 ft. Ames, raise and fall rest.
10 in. x 5 ft. Reed, plain gib rest.

Drills.

6 ft. arm Putnam Machine Co., radial, very heavy.
4 ft. arm Bickford radial, with tapping attachment, nearly new.
4 ft. arm Bickford radial, plain.
3 ft. arm Betts radial, all complete and good.
36 in. swing Sellers, B. gears and power feed.
26 in. swing Snyder, B. gears and power feed.
24 in. swing Harrington, with tapping attachm't.
2 spindle Norton, sensitive with power feed to spindle.
3 spindle Slates, sensitive with chucks.

Shapers.

24 in. stroke Walcott, shifting belt, in fine order.
24 in. stroke Hendey friction, complete with all parts.
16 in. stroke, Gould & Eberhardt, adjustable crnk.
16 in. stroke, Prentiss friction, good as new.
12 in. stroke Prentiss, adjustable crank.

Milling Machines.

4 spindle Warner & Swasey valve miller, nearly new.
No. 3 Hilles & Jones vertical, all feeds.
No. 1 Beaman & Smith duplex, nearly new.
22 x 22 x 5 ft. Ingersoll Slab, very heavy and powerful.
No. 2 Grant & Bogart double column, in fine order.
No. 2 Brown & Sharpe, plain, back geared.
No. 3 Brainard, plain, back geared.
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2 Pratt & Whitney Lincoln pattern, with attachments.
2 No. 3 Garvin hand, with attachments.
No. 1 Pratt & Whitney hand, with all attachm'ts.

Screw Machines.

No. 3 Pratt & Whitney, with friction head and drawing spindle.
No. 3 Pratt & Whitney, with wire feed and power feed to turret.
No. 2 Pratt & Whitney, with wire feed.
No. 2 Windsor, plain, with all attachments.
No. 1 Jerome & Secor, with wire feed attachment.
2 Pratt & Whitney screw shapers.

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3 500 ton Holyoke hydraulic presses, complete, with pumps as good as new; platen 31½ x 34 in., diam. ram 14 in.
D73 Ferracute double action, draws 2 in. shell, good as new.
D2 Ferracute double action, draws 2 in. shell, good as new.
P3 Ferracute punching press, 1½ in. stroke.
No. 0 Brown power press, 1 in. stroke.
No. 1 Toledo inclined press.
No. 2 Bliss arch screw press.
1,100 lb. Billings & Spencer friction drop hammer, all complete.
800 lb. Merrill friction drop hammer, all complete.
700 lb. Merrill friction drop hammer.
600 lb. Pratt & Whitney friction drop hammer.
400 lb. Pratt & Whitney friction drop hammer.
300 lb. Peck poppet drop.
1,000 lb. Bement double stand steam hammer.
250 lb. tubular Barrow steam hammer.
125 lb. Beaudry power hammer.

We have also just secured in connection with a large plant, 12 power presses, all sizes and makes, ranging in weight from 1,000 to 10,000 lbs. Shall be glad to furnish full information and descriptions to any one interested.

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25 in. Gould & Eberhardt full automatic gear cutter, in fine order.
56 in. x 12 ft. Nicholson & Waterman horizontal boring machine.
6 ft. Michel vert. boring and turning mill, 2 heads.
No 1 Slate auto. pinion cutter with lot of dials.
2 in. Sellers automatic bolt cutter, with full set of taps and dies.
1½ in National automatic bolt cutter, with full set of taps and dies.

Send for complete lists of new and second-hand machinery in stock.

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A Few of the

MODERN SECOND-HAND TOOLS

in first-class order lately secured.

ENGINE LATHES.

18 in. x 6 ft. Ames, "screw cutting reverse."
14 in. x 6 ft. Flather, taper att., cross feed and ck.
16 in. x 6 ft. Flather, 1 1-16 hole, cross feed and ck.
16 in. x 6 ft. Perkins, 1 1-8 hole, cross fd, R.F.rest.
18 in. x 6 ft. Bradford, 1 1-4 hole, cross fd. and ck.
18 in. x 8 ft. Flather, cpd. rest and cross feed.
19 in. x 10 ft. Lodge-Davis, cpd. rest and taper att.
20 in. x 10 ft. Putnam, cpd. rest and cross feed.
21 in. x 9 ft. Lodge-Davis, cpd. rest and taper att.
22 in. x 10 ft. Fifield, cpd. rest and cross feed.
23 in. x 10 ft. New Haven late pat., cpd. rest, etc.
24 in. x 12 ft. Putnam, cpd. rest and cross feed.
24 in. x 23 ft. D. W. Pond, cpd. rest and chuck.
32 in. x 18 ft. Fay & Scott, late pat., cpd. rest, etc.
40 in. x 14 ft. Fitchburg, cpd. rest and cross feed.
58 in. x 12 ft. Gage, cpd. rest, cross feed, 54 in. ck.
90 in. x 30 ft. Ames, triple geared, cpd. rest.

PLANERS.

16 in. x 16 in. x 4 ft. Hendey, shifting belt.
24 in. x 24 in. x 5 ft. L.W. Pond, latest pattern.
26 in. x 26 in. x 5 ft. Pond (Plainfield), extra heavy.
26 in. x 26 in. x 8 ft. Ferris & Miles.
30 in. x 26 in. x 9 ft. Rochester.
32 in. x 32 in. x 8 ft. D. W. Pond, two heads.
36 in. x 36 in. x 8 ft. Bement.
36 in. x 36 in. x 24 ft. Sellers, extra side head.
38 in. x 42 in. x 10 ft. Pond.
48 in. x 48 in. x 16 ft. Putnam Machine Co.

SHAPERS.

8 in. stroke Gould crank motion.
14 in. stroke Fitchburg, traveling head.
15 in. stroke Hendey, improved style.
16 in. stroke Prentiss, friction.
16 in. stroke, Gould & Eberhardt.
24 in. stroke Hendey, friction.

DRILLS.

20 in. swing Prentice, wheel and lever feeds.
21 in. swing Prentice, back gears, hand feed.
25 in. swing Lodge-Shipley, back gears, auto. fd
28 in. swing Aurora, back gears, auto. feed.
30 in. swing Prentice, back gears, auto. feed.
36 in. swing Snyder, back gears, auto. feed.

UNIVERSAL MILLERS.

Cincinnati No. 1 1-2, back gears, arm and att's.
Cincinnati No. 3, back gears, arm and att's.
Cincinnati No. 4, back gears, arm and att's.
Brown & Sharpe No. 1, with attachments.
Brainerd No. 15, arm and att's.

SCREW MACHINES—(Wire Feed).

9-16 in. Jones & Lamson.
23-32 in. Bardons & Oliver No. 2, latest.
1 5-32 in. Bardons & Oliver No. 3, latest.
1 5-16 in. Jones & Lamson 7 x, with tools.
2 1-8 in Jones & Lamson 8 x, all atts. and tools.

MISCELLANEOUS.

Presses—Stiles No. 2-4; Bliss No. 19-20.
Universal Grinder No 1, Diamond Co's.
Boring and Turning Mill, 40 in. swing.
Floor Boring and Drilling Machine, large size.
Cutting-off Machines, 2 and 3 in.
Boiler Rolls, Punches, Shears, etc.

J. J. McCABE,

14 DEY ST., NEW YORK.

Philadelphia Branch, The Bourse.

Almost New Machine Tools

—AT—

SECOND-HAND PRICES.

1 84 in. x 18 ft. Engine Lathe.
1 26 in. x 14 ft. Fitchburg Engine Lathe.
1 English Slotter, 14 in. stroke.
1 Universal Radial Drill, 5 ft. arm.
1 63-in. Pond Vertical Boring Mill.
1 6-ton Single-Acting Steam Hammer.
1 2-ton Double-Acting Steam Hammer.
1 2,500-lb. Double-Acting Steam Hammer.
1 Helve Hammer.
1 No. 7 Hilles & Jones Shear.
1 Morgan Electric Crane, 15 tons.
3 Dynamos.

HILL, CLARKE & CO.

156 Oliver Street, BOSTON, MASS. | **12 South Canal Street, CHICAGO, ILL.**

SECOND-HAND MACHINERY.

ENGINE LATHES.

1 11 in. x 4 ft. Mann.
1 14 in. x 3 ft. 6 in. Putnam.
1 14 in. x 3 ft. 6 in Prentice.
1 15 in. x 6 ft. Starr.
1 15 in. x 6 ft. W. & L.
1 16 in. x 7 ft. D. & H.
1 18 in. x 8 ft. D. & H.
1 27 in. x 10 ft. D. & H.
1 32 in. x 13 ft. Bement.
1 48 in. x 18 ft. G. & S.
1 48 in. x 16 ft. Fifield.

PLANERS.

2 16 in. x 16 in. x 4 ft. Hendey.
1 24 in. x 24 in. x 6 ft. Powell.
1 28 in. x 28 in. x 8 ft. G. & S.
1 30 in. x 30 in. x 8 ft. S. & S.
1 30 in. x 30 in. x 10 ft. Niles.
1 32 in. x 26 in. x 12 ft. Gray.
1 36 in. x 36 in. x 12 ft. Powell.
1 36 in. x 36 in. x 18 ft. Sellers.
1 54 in. x 54 in. x 20 ft. Niles.

SHAPERS.

1 9 in. traveling head, Wm. Sellers.
1 13 in. Traveling Head, Bement.
1 16 in. G. & E., triple G.
1 16 in. G. & E., single G.

DRILLS.

1 34 in. Harris, Bk. G.
1 32 in. L. & D.
1 3 spindle Hendey.
1 No. 3 4 spindle Garvin.
1 6 spindle Quint.
4 Suspensions, Pond.

SCREW & CHUCKING MACHINES.

1 No. 2 P. & W., plain.
1 No. 1 Costello, wire feed.
1 No. 2 Costello, wire feed.
1 No. 2 1-2 P. & W., wire fd.
1 No. 4 Windsor, plain.
1 No. 4 Windsor, wire feed.
1 No. 2 Niles.
1 18 in. P. & W. Chucking Machine.

MISCELLANEOUS.

1 P. & W. Grant Pattern Miller.
1 48 in. Niles C. W. Borer.
1 48 in Industrial C. W. Borer.
1 72 in. Niles B. & T. Mill.
1 3 ft. Riveter, "Portable."
1 No. 2 P. & A. Cyl. Borer.
1 10 in. New Haven Slotter.

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Boring Bars,

10 inches in diameter, 16 feet long, two heads supported on two housings, driven by worm and worm wheel. Also two smaller bars. Will sell cheap, or trade for other machinery.

Monighan Machine Works,

817 Carroll Avenue, Chicago, Ill.

MACHINERY--SECOND-HAND,

Prices to move quickly. Condition guaranteed as stated.

ENGINE LATHES.

13 in. x 40 in. centers, plain rest, Ames, A1.
14 in. x 36 in. centers, with 3 in. gap, rest and fall rest, Sellers, A1.
18 in. x 2 ft. 10 centers, p. r., with ck., Bradford, A1.
21 in. x 48 in. centers, with ck., Bradford, A1.
25 in. x 40 in. centers, cp. rest, " "
47 in. x 11 ft. centers, plain rest, good order.

BRASS FINISHERS' LATHES.

14 in. x 5 ft. bed, fixed tailstock, two motions to spindle, Amer. T. & M. Co., A1.
14 in. x 5 ft. 6 in. bed, set over, 2 motions to spindle, slide rest, 9 in. chuck, Amer. T. & M. Co., A1.

DRILLS.

10 in. Barnes Sensitive, good order.
10 in. 3 spindle Sensitive, Dwight Slate, A1.
Bicycle Assembling, Woodward & Rogers, A1.
20 in. Barnes, sq. base, w. and l. feed, A1.
22 1-2 in. Barnes, b. g., p. f., q. r., A1.
30 in. Prentice Bros., b. g., p. f., q. r., A1.
40 in. New Haven, b. g., p. f., q. r., A1.

PLANERS.

26 x 24 x 5 ft. New Haven, friction driven, like new.
26 x 24 x 7 ft. New Haven, A1 36 x 36 x 8 ft., g. ord.

HAMMERS.

40 lb. Bradley helve, A1. 75 lb. Bradley upright helve, A1. 60 lb. Belden upright, A1. 2600 lb. double standard steam, A1.

BOLT CUTTERS AND PIPE MACHINES.

1 in. Acme bolt cutter, single head, like new.
1 in. Acme bolt cutter, double head, like new.
2½ in. Merriman bolt cutter, like new.
No. 4 Peerless pipe machine, good order.

MISCELLANEOUS.

No. 4 Warner & Swasey sc. mac., fr. gd. hd., A1.
14 in. x 5 feet turret lathe, with cut-off rest and chuck, Lodge, D. & Co., A1.
Q. & C. portable rail saw, hand and power, A1.
Adt. auto. wire straightener and cutting-off machine, capacity No. 9 to 18, inclusive, A1.
2 in. Washburn twist drill grinder, A1.
2½ in. cutting-off machine, auto. feed, A1.
Dennis belt strapping machine, A1.
No. 7 Diamond emery grinder, with sur. attach.
Gear cutter, Windsor Mach. Co., good order.
Garvin profile or edging machine, good order.
16 x 24 Atlas auto. engine, A1.
500 H. P. Stilwell-Bierce live steam purifier, A1.
200 lb. Peter Wright anvil, A1.
262 lb. Peter Wright anvil, A1.
30 in. Fox bicycle tube cutter, A1.
No. 3 Amer. Gas Furn. Co., high pressure blower, with forges and brazing tables, A1.
Complete bicycle chain making plant, Garvin Mach. Co., good order.

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Almost two hundred machines in stock.

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One 36 in. x 28 ft. Betts Engine Lathe.
One 24 in. x 10 ft. New Haven Engine Lathe.
One 21 in. x 7 ft. Lodge & Davis Turret Lathe.
One 15 in. x 5 ft. A. T. & M. Co. Fox Lathe.
One 30 in. x 30 x 7 ft. New Haven Planer.
One 26 in. x 26 x 7 ft. New Haven Planer.
One 48 in. A. Box & Co. Radial Drill.
One 36 in. Gould & Eberhardt Spur Gear Cutter.
One 19 in. Putnam Slotter.
One 10 in. New Haven Slotter.
One 48 in. Pulley Borer.

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NEW AND SECOND-HAND MACHINERY.

Lathes, from 12" to 48"; Planers, from 20" up to 60, 48", 54" and 60" Radial Drills; No. 2 Newton Milling Machine; No. 2 Screw Machine; Shapers, from 6" to 30", Boilermakers' Punches, Shears, Edge Planers, Rolls, Drills, Engines, Boilers, Pumps, and Dynamos.

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Second-Hand Machinery.

ENGINE LATHES.

13 in. x 6 ft. Ames, R. & F. rest, 6 in. chuck.
14 in. x 6 ft. Wright & S., rise and fall rest and 8 in. chuck.
15 in. x 6 ft. Bogert.
15 in. x 6 ft. Reed.
15 in. x 8 ft. Pratt & Whitney, rise and fall rest.
16 in. x 5 ft. Hand Lathe, 3-4 in. drill chuck, swivel vise, milling attachment, slide rest, extra head for milling.
16 in. x 8 ft. Pratt & W., rise and fall rest.
24 in. x 17 ft. Blaisdell, comp. rest, 18 in. 4 jaw chuck.
26 in. Stevens Pulley Lathe.
50 in. Stevens Pulley Lathe.
2 Lodge & Davis Fox Lathes.

PLANERS.

Blaisdell Crank Planer.
16 in. x 16 in. x 3 ft. Pratt & W.
20 in. x 20 in. x 6 ft. Pease.
24 in. x 24 in. x 8 ft. Fitchburg.
42 in. x 12 ft. Richards open side; weight, 42,000 lbs.

DRILL PRESSES.

No. 2 Pratt & W., 4-spindle.
1 10 in. Stover, 6-spin. tur. drill.
2, 3 and 4 spindle Garvin Gang Drills.
1 4-spindle Ames.
20 in. W. & L. Feed, Davis.
21 in. Pratt & Whitney, auto. feed, back gears.
7-spindle Adt. Drilling and Countersinking Machine.
1 22 1-2 in. Barnes, W. & L. feed, back gears, auto. feed and trip.
3-spindle Baker Drill.
9-foot Holly Radial Drill.

MILLING MACHINES.

No. 1 Universal, Garvin.
No. 2 Kempsmith.
No. 2 Garvin, plain.
No. 4 Garvin, bk. fd., without arm.
No. 2 Garvin auto. Sprocket Wheel Miller.
50 in. Brainerd Keyseater.
Pratt & Whitney Circular Mill r.
Ames Hand Miller.
Niles Power Miller.
Lincoln Miller for sprocket wheels.

SCREW MACHINES.

1 21 in. x 6 ft. Flather Turret Lathe, back gears and auto. feed to turret.
1 14 in. Garvin Turret Lathe, with pan.
1 Garvin No. 1, wire feed.
1 Brown & S. No. 1 wire feed.
2 Garvin No. 2 1-2, wire feed.
1 No. 2 Pratt & Whitney, plain.
1 No. 3 Pratt & Whitney w. f.
1 No. 2 Windsor, w. f., chasing bar and tools.
1 No. 4 Warner & Swasey, geared fric. head, oil pump and 2 jaw chuck.
1 x 8 Jones & Lamson, plain, with 2 jaw chuck.
2 Pratt & W. Hub Machines, geared fric. head, oil pump and 2 jaw chuck.

SHAPERS.

18 in. Wood & Light, traverse.
12 in. Crank, Juengst.
15 in. Hendey.
24 in. Hendey.

MISCELLANEOUS.

2 H. P. Nash Gas Engine, with sound deadener, gas bags, etc.; 1 No. 2 Garvin Auto. Tapper; 1 Garvin Boring Mill; 1 40 in. Boring and Turning Mill, 1 Head, new; 1 American Gas Furnace; 1 Dienelt & Eisenhardt Hammer; 1 28 x 16 x 52 in. Springfield Surface Grinder; 1 Garvin 1-Spindle Profiler; 1 No. 3 Garvin Cutter Grinder.

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By the absence of nut adjustment these Reamers are rendered practically solid, and the adjustment is permanent and accurate.

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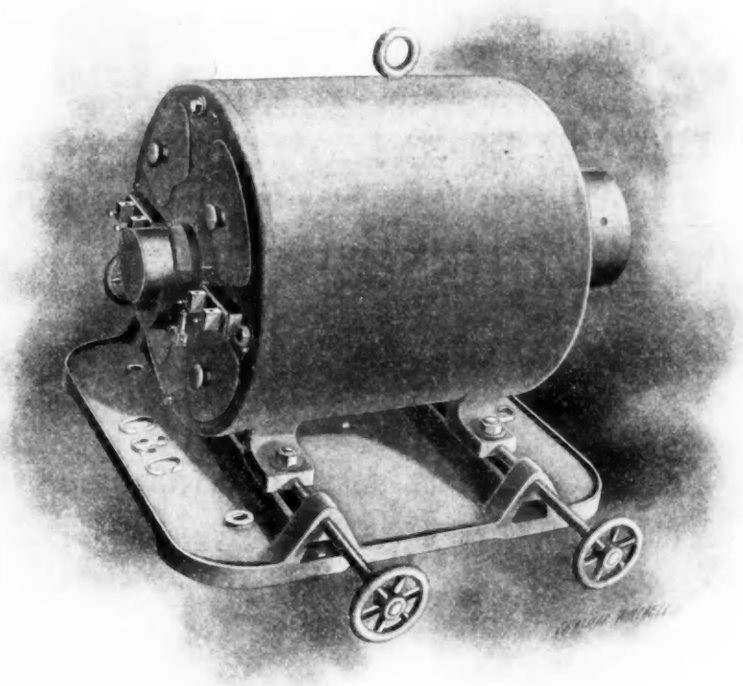
The name of WESTINGHOUSE is a guarantee.



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for Gearing, Direct Connecting or Back Gearing to all classes of machinery, including Elevators, Presses, Hoists, Pumps, Shears, Turntables, Machine Tools, Punches, Cranes, Wood Working Machines, Drawbridges, Blowers, etc., etc.

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C & C Slow Speed Ironclad Motor,

ENTIRELY INCLOSED TYPE,

is **Dust=proof** and **Moisture=proof,** and can be placed in any desired position on the floor, wall or ceiling.

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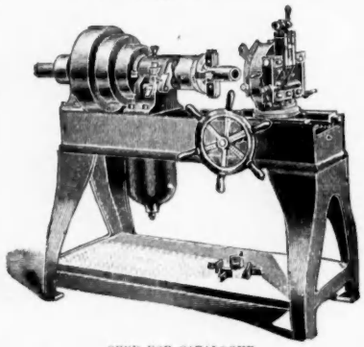

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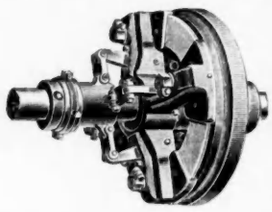

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except what it was designed for. 'Twas designed to take hold when you want it to, and to let go when you want it to, without any funny business of any kind. Frisbie Friction Clutches have been in use for a great many years, and they have given universal satisfaction. Literature free.

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ship $1,000,000 worth of tools a year, but we make and sell a great many more than most people think we do.

People are getting to know that the Engine Lathes, Pattern Makers' Lathes, Turret Lathes, Planer, Centers, etc., made by Fay & Scott are good, honest, reliable tools, and that when it comes to a matter of price—but that's another story.

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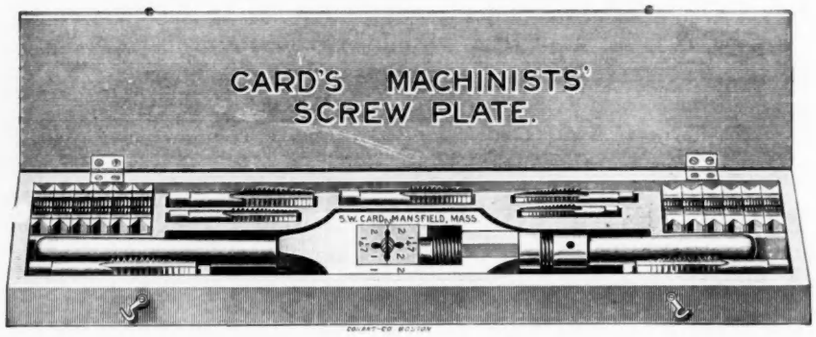

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$6 to $35 per inch diameter of rod. In use on 15,000 locomotives, the largest and best steamships, and everywhere that a packing is needed that will pack properly.

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New Metal Planer, 129 in.x72 in.x37 ft.

Two heads on rail; one head on each housing.

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Consumes less power and gives better results than the old style worm gearing.

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"MONARCH" RIVETLESS LEATHER BELTING.
Write for Catalog "A."

There are no critics

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Nothing is impossible to industry.
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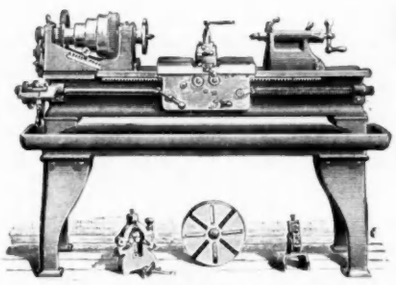
No. 100.—Morse Taper Socket.
STEEL SOCKETS,
FOR TAPER SHANK DRILLS.

A short saying oft contains much wisdom.
SOPHOCLES.

A Manufacturer's Ideal Lathe



Beds deep and heavy. Cone pulleys large diameters for wide belt; hole through spindle extra large; extensive range of both threads and feeds. Compound or plain rests. Raise and fall rests can be furnished on 14 inch and 16 inch.
Quick change gear mechanism obtains any thread or feed instantly and without removing any gear or belt. Guaranteed accuracy, truth and workmanship.

Sizes 14-in. to 42-in. Swing. Beds in even lengths.

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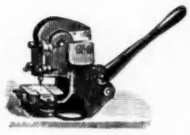
CINCINNATI, OHIO, U. S. A.
AGENTS: Selig, Sonnenthal & Co., London, E. C.; Adler & Eisenschitz, Milan, Italy.

$14.00



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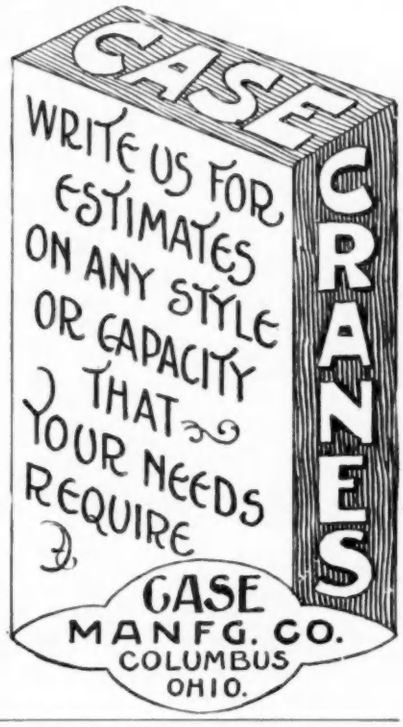
Cleveland, O.

$6.00

$3.75



I am not a *"jack of all trades,"* although I can do many things well, and am a *handy fellow* to have round, for I can *drill* a little hole or *bore* a big one. Can also do a good job of *milling*. Yes, I can *tap*, too, as my spindle revolves in either direction. Goes quick or slow, any way to please you.

Yes, my head is a *great* one and full of *business*. An eminent phrenologist pronounces it *perfect*. It is provided with considerable movement, either vertical or horizontal, by power, quick so as to get there, or slow for milling.

I have a platen for work; it is as wide and long as you may want it, and a revolving table if you say so.

If you will ask my sponsors, BEAMAN & SMITH, Providence, R. I., will tell you lots about me, also of an uncle of mine that is a *boss miller*.

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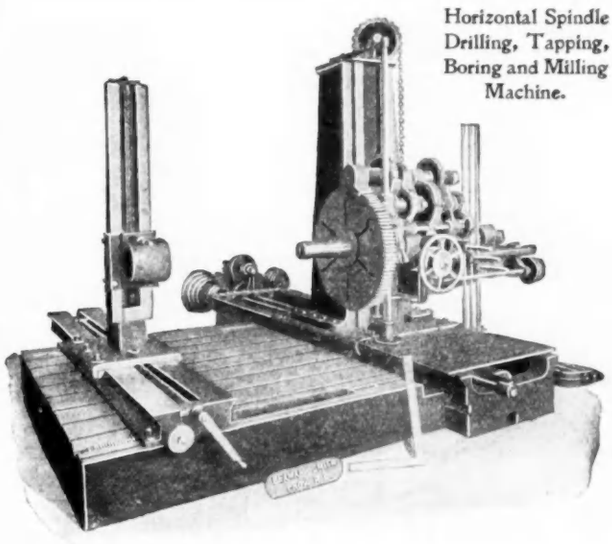
THE GARVIN MACHINE CO., Berlin.



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3-SPINDLE RAIL DRILL.

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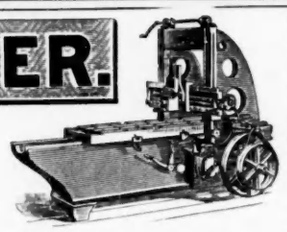

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Manufacture Planers as an exclusive specialty.

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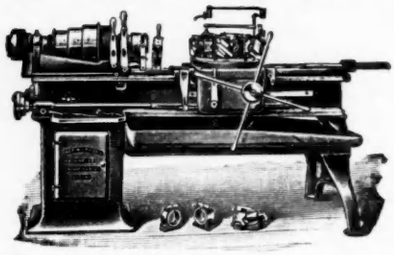

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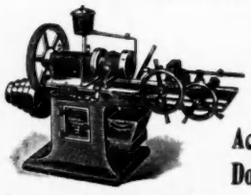

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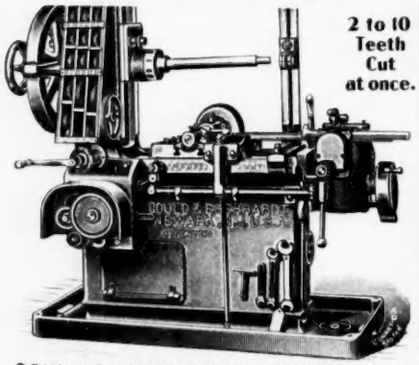

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